COAL AGE

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Humanity and Good Fellowship

AS a usual thing there is a considerable difference in the point of view of the man at the face and the mine superintendent. The latter's conception of mining details should be much clearer than the coal digger's.

However, the most successful mine executives are those who do not refuse to listen to their employees' suggestions.

"The company pays ME *(!) to run this mine, and I don't want any of you fellows to butt in."*

We know of a superintendent (now digging coal) who, when any of his men suggested some real improvement, would invariably reply: "The company pays ME (!) to run this mine, and I don't want any of you fellows to butt in."

However, when a new idea from one of the men did get to him, he would apply the suggestion to the operation of his mine, and when the manager next came around he would point to the improvement and ask—"What do you think of my new plan?"

So successfully did he work this game that he held his position with the company for several years, but "murder will out," and eventually the general manager got wise to his tactics and a new superintendent was put in charge. It is needless to say that few of the miners expressed regret.

We know another superintendent—his name is Jim. He encourages his men to suggest any improvement that they think will benefit the working of the mine. He is considerate and always ready to listen when Tom, Dick or Harry tells how little Bob is getting along at school.

If the men at the mine have a grievance, they can always count on Jim's willingness to listen to their story.

As a result of his just and generous administration, a bond of sympathy and friendship grew up between Jim and his miners, so that recently when he was promoted to general manager all the men serving under him got together and presented to him a handsome token of their deep appreciation.

The superintendent that does not possess a kindred feeling toward his fellow-mortals will never be permanently successful. When any man in a position of authority becomes an autocrat, he has failed to realize or at least to observe the old truth, "There is so much good in the worst of us." He has failed to grasp the spirit of co-operation as applied to production.

Let us get rid of our aloofness and settle down on the bed-rock of common-fellowship. Let us eliminate coldness, and in its stead feel that we all belong to one great society.

Why attempt to "go it alone" when a hundred hands are ready to help if only the opportunity is afforded them.

Suggested by William Crooks, Ensley, Ala.

Ideas and Suggestions

Will the Worm Turn?

By R. Z. Virgin*

During the past few years mine superintendents have been seriously studying the construction and makeup of mine cars. Among other things this question is often asked by the man whose money is invested or expected to be invested: How does it occur that cars in olden times cost less than one-half the present cost and were about one-half as light, and the mine produced about the same amount of coal?

I believe the investor has the right to ask such a question. A few years ago the average car built for 2-ton capacity weighed about 1800 lb. and cost about $20.

There are numerous firms of car builders each striving to outdo the other and each expecting his cars to run easier, longer, faster and to stand up better than any other company's product. So each firm takes out certain patents, and every time a patent is granted the coal companies are charged "so much" per car extra for these "improvements" until such prices are asked for cars and car irons that mining-men are studying the construction of the cars made in former days.

The standard mine-car wheel used to weigh about 90 lb.; now it weighs 140 lb. To this latter weight must be added channel bars weighing 35 lb. each and extra boxings or bearings weighing a total of 40 lb. Two straps used to be sufficient on the end gate; now it takes four straps, and double ones at that; and in addition a plate of iron $\frac{3}{16}$ in. thick is added to the door, the makers say "to strengthen it."

Irons all over the car have doubled in thickness and width, until the once 1800-lb. car now weighs (with the improvements) from 2800 to 3500 lb., and the cost of such rolling stock has increased at the rate of almost 100 per cent. Is there a good reason for it? They haven't reduced the costs of hauling nor bettered the product.

Is the Increased Cost Warranted?

No corporation or individual is in business for pleasure; so what warrants this additional outlay of money and also dead weight carried?

Large cars, with modern improvements, are large investments; the improvements require high-priced labor to make repairs, also high supervision costs. Will they save their cost and show a profit after their upkeep and the interest on the investment are considered?

I have in mind a colliery having 450 cars, each carrying 700 lb. of "improvements," which is 315,000 lb. in all. Each car makes two round trips per day, which causes the company to haul 315,000 × 2 = 630,000 lb. of "improvements" 5 miles per day. Figuring 300 days per year, the coal company is carrying a load of 189,000,000 lb. of "improvements" per year. It is not the first cost that counts, but the continual outlay for power, etc., to keep these "improvements" moving.

The price of coal has gone down; the price of mine cars has gone up. At the mine already referred to, when the wire cable breaks the cars run down an incline and are wrecked, being almost a total loss. If the most expensive cars would survive just two such accidents, they would be equal to the light cars; if they would stand three such accidents, they would be superior; but they all have been a total loss after the first wreck.

Heavy dead-weight cars require heavy locomotives to haul them. This in turn requires heavy rails, and then heavier ties, and then larger spikes. Furthermore the heavier cars and larger ties require higher and wider haulways, and the roof must be blasted, causing an increased outlay for yardage costs. Is the game worth the candle?

Are Such Heavy Installations Justified?

During the past few years cars have become so large that companies are placing capacities, light weights and numbers with the firm's name on the sides, and they are now holding 4 tons, or 8000 lb., together with a car weight of 3500 lb., making 11,500 lb. in all. Totaled up this gives a gross load of about 7 tons. Can you imagine what size rails and ties it will take in the rooms and pillars to accommodate these cars? Can you imagine men in rooms handling rails 35 to 45 lb. per yard? Can you imagine this size rail going around the room necks into each room? I very much doubt the wisdom of such an installation.

During this steady increase of weight in the cars, did the coal loader share in the benefits, if there were any? Did he get any more pay for pushing the cars? We boast of not having a mule in the mine. Is it a credit to the firm? This latter thought has not been given the consideration it ought to have, and the worm may soon turn.

*Superintendent West Virginia-Pittsburg Coal Co., Colliers, W. Va.

An Explosion Overcast

By Ralph W. Mayer*

The Roslyn-Cascade Co., William McKay, manager, uses at its No. 2 mine, of which James Ash is mine foreman, a light, substantial and inexpensive overcast, which can be quickly replaced if it should happen to be blown out.

The stoppings or walls across the air-course and parallel to the entry are built of concrete or 8x8-in. timbers, squared as high as the roof of the entry. They are set in hitches cut into the ribs and sealed with cement grout. If timbers are used, they are fastened together with drift-bolts and banked up with waste to strengthen the walls. On top of these walls light steel rails are laid, one end on each wall and reaching across the entry. Three or four feet apart is as close as it is necessary to lay the

*Roslyn, Wash.

rails, having one on each side of the overcast to support the walls that reach from the overcast floor to the side or top of the excavation made for the passage of the air.

These rails have two fishplates bolted to each end, which are given a half twist and bent at a right-angle, so that they reach down over the side of the wall or stopping, to which they are fastened with spikes or small drift-bolts, holding them securely in position.

Across these rails and parallel with the entry are laid sheets of ⅛-in. iron or steel, having the same length as the width of the overcast. These sheets are given a lap of three or four inches on their edges and are fastened together with bolts placed a foot or so apart, but are not fastened to the steel rails at all. An explosion would simply raise them off the rails, leaving the rails and stoppings or walls of the overcast uninjured, and the overcast could easily be repaired.

The side walls of the overcast over the entry can be built either of concrete or wood on top of the sheet steel, or a couple of extra rails can be laid across the entry on the sides of the overcast and used to build the walls on, leaving the sheet steel free. A rope grease or some rust preventive is spread over the steel on the floor of the overcast to prevent its rusting.

A 2-in. plank is laid over the overcast above one of the rails to walk upon and to keep the sheets of steel from being sprung. A couple of fishplates bent at right-angles are spiked to each end of the plank and to the side of the wall upon which the rails rest, so that the plank is always in position.

The Coal Mine Clerk

By Neill Hutchings*

Several thousand clerks are engaged in doing the clerical work for the coal-mining companies of America.

Most of them have been told that clerks cannot be classified as to work and fitness like men in the operating end of the business. They say the work of a clerk is of an intangible nature and difficult to measure; also that these men are nonproducers. The fellows who work as mine captains, foremen, superintendents, etc., are in the producing end. Thev can smash records. The clerk can't, they say.

Without doubt there are thousands of clerks, storekeepers, timekeepers, shippers, weighers, bookkeepers and so on who believe they haven't got a chance to break records. Only too often the clerk lets himself believe his only chance for promotion is for the man ahead of him to die or move on. His pay is not what he wishes it was. In many cases this is due to the fact that he allows himself to believe he can't help it.

Because somebody told him that classifying clerks was an impossible thing, he was so deluded as to believe it. When Mme. Schumann-Heink, the great singer, started her career, a noted musician told her to quit trying to sing and go back to sewing. She would not listen to such advice nor believe that she could not sing. Now she can sing anywhere on earth and name her own figure.

Clerical Force Is a Factor in Success of a Business

The clerical force of the accounting organization of any coal concern is as great a single factor in the success of the business as the operating department. As for the individual clerk, he can break records and do things worth while just as well as any man in the company from president down. The trouble with some men is, they want to measure anything they do with whatever things a bigger man may do and are unable to see that *doing things* is what counts rather than the magnitude of what is done.

It used to be true in some concerns that a clerk was looked upon as a "person," while the man who was an official of whatever title in the operating end was looked upon as a "personality." We know better now. We have long ago learned that power and worth are the measure of "personality." A clerk may be a personality just as easily as any other man. If he wants to achieve personality, here are three rules for him to follow:

First, he must get away from tradition and believe he can perform things as well as any other man. Break a record by smashing tradition.

Second, remember that time is his greatest asset and quit wasting it. Then concentrate and make up his mind to do more on his job and do it better than anyone else ever did. No concern can overlook such a clerk as he will be if he does this.

Third, he must really want to be more than a clerk. Then as soon as he knows what he wants to be in his business, he must take some of the time he now wastes and use half an hour or an hour each day to study his work, enrich his mind and obtain the accurate knowledge necessary to success.

If he will give only 30 minutes a day to the study of some splendid idea as against wasting that much of his time, he cannot miss achieving success for himself and his concern.

The clerk who would succeed must invest as many moments and hours as he can in learning to be worth more to his concern. He must quit thinking that either himself or his ability is unclassified. It is just as true of the clerk as of any man in the concern from president down that he is paid what he is worth.

Good clerks are not common. Unfortunately for companies who need them, they are rare. For him, it is fortunate that this is true; that is, if he really wants to prove his worth. He has as much chance as any other man alive today.

*Birmingham, Ala.

Commissary Management

In order to counteract the losses due to carelessness, dishonesty and incompetence, it is always advisable to make inventories of commissary stocks on the basis of selling price. After making an inventory of this kind, mark with the selling price all stock purchased thereafter. At the end of any merchandising period, preferably not over four or six months, take another inventory, also at selling price. The amount thus inventoried should be deducted from the total of the former inventory, to which has been added the total price for goods purchased in the interim. This should agree with the book record of gross sales after making due allowance for unavoidable inaccuracy in weights and measures. The value of the goods spoiled during the period and the difference in the price of goods which are marked down should be added to this allowance.

The first year this plan was put in operation at a commissary store in the Middle West the increased profit on sales was 6 per cent., in the second year 10 per cent. and in the third to the fifth year from 9 to 11 per cent.

The Air-Lift Pump for Coal Mines

By S. W. Symons*

SYNOPSIS—The principle of operation of the air lift has in the past been carefully shrouded in considerable mystery. The formulas used in calculating the amount of air required as well as its pressure per gallon of water pumped under known conditions of lift and submergence are here given.

The air-lift pump has found its chief field in municipal and private water-supply, and there are many large coal mines using it for such purposes. It has not been used extensively for shaft unwatering and mine drainage, although it is better adapted to such work under certain conditions than any other method of pumping.

Of the many air-lift plants in operation, some are working at a better economy than would be possible with other methods of pumping. As the matter of cost of operation is one that can be determined only after knowing all the working conditions of a given case, economy is often by no means the governing consideration; sometimes reliability and simplicity are of even greater importance, and it is in such cases that the air-lift method excels.

For shaft unwatering, the ease and cheapness of installation, absence of moving parts under water, ability to handle acidulous and foul water and the high rate of discharge from a given size of pipe are obvious advantages peculiar to the air lift.

For mine-drainage work, the great simplicity of the system, the fact that any number of pumps can be operated from one compressor plant and the absence of complicated mechanism in restricted situations underground are its chief recommendations.

A special case of mine drainage where the air lift can be used to great advantage is when water is struck at a low level a long distance from the main pump or shaft—sometimes a matter of a mile or more. Instead of laying long and expensive pipe lines, it is often both cheaper and more satisfactory to install an air lift by putting in a bore-hole from the surface to pass through the workings at or near the low point. With a properly designed air-lift pump it is easy to see that the efficiency of such an arrangement would be considerably greater than the forcing of the water through several hundred feet of pipe to the shaft. Fig. 1 shows the arrangement clearly.

Just such a case was that of the Clinton Coal Co., of Clinton, Ind., described briefly in the Jan. 17, 1914, issue of Coal Age. In this instance water had broken into the mine about 4000 ft. from the shaft at a spot 160 ft. from the surface. It was not until after two lines of 3-in. pipe had been laid and proved inadequate that resort was had to the air lift. The lift was kept in operation 24 hr. a day for four months before the water was sufficiently reduced to resume mining, and it is of course still in operation a small part of the time.

When it is not feasible to carry the bore-hole below the level of the workings (which is necessary with the usual type of air lift in order to provide "submergence"), a pump can be installed in the manner described in Coal Age of Apr. 4, 1914. This is known as the Jones system of compressed-air pumping and consists of a direct-acting pump operated by compressed air working in conjunction with an air lift. The direct-acting pump discharges both air and water into a closed tank, from which the exhaust air expels the water through an ordinary air-lift pump. The function of the direct-acting pump is to put a "head" on the water equivalent to that obtained by the submergence which would be necessary for a standard air-lift pump.

Before enumerating the features which appeal to the practical mine operator it might be well to outline the general principle of the air lift.

Operating Principle of the Air Lift

Thirteen years ago Dr. Julius G. Pohlé first proposed, in a commercial way, that the most scientific method of

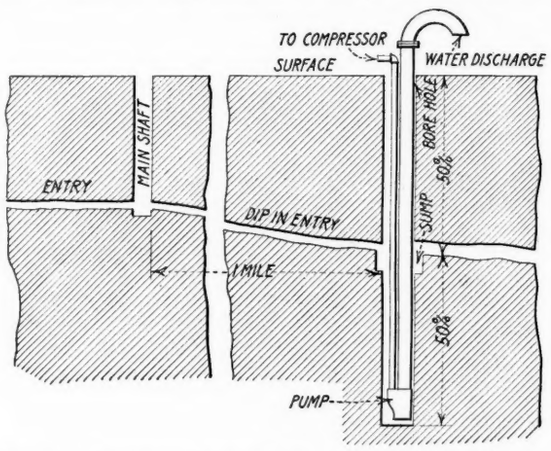

Fig. 1. Showing How Mine Workings May Be Drained by Air Lift

inducing water inside a pipe to rise higher than the water outside the same pipe was to reduce the weight, or specific gravity, of the column of water within the pipe, when the greater relative weight of the water outside would act to force the lighter column upward. The simplest method of lightening the column of water in the pipe is to mix air with it. This mixing of air and water is what the so-called air lift does, and it is practically all that it does, while gravity does the rest.

Notwithstanding the length of time during which the air-lift system has been in commercial use and the thousands of plants in successful operation, it is still considered more or less fashionable to make a mystery of its operation. This condition has been fostered to a great extent by the number of variable factors entering into the proposition, making it difficult to derive practical working formulas; also by the fact that manufacturers making a specialty of selling and installing these systems have obtained their data and experience at considerable expense and have consequently been unwilling to divulge to the public the tables used when making calculations. The result is that less is known by engineers in general about the proper design and requirements for an air-lift pump than in almost any other branch of engineering practice.

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The original theory of the air lift was that air and water entered the pipe alternately, forming layers or pistons of air in the pipe, which forced corresponding pistons of water upward. Though there was undoubtedly some action of this sort in the older air lifts, this theory, from an efficiency standpoint, has long since been exploded.

Figs. 2 and 3 show what was the most common method of piping wells up to a few years ago. It will be seen that the air is introduced into the rising main through a large opening, so as to encourage the formation of "pistons" as already explained.

Compressed air in the air-lift pump does not push or force the column of water upward after the first discharge. When air is forced down the well to a proper point and allowed to escape into the rising main, the effect after the first emission of water from the pipe, which comes out *en masse,* is to aërate and reduce the specific gravity of the contents, which are moved upward by the buoyancy and expansion of the air bubbles, aided by the greater weight of the solid column of water surrounding the eduction pipe. Contrary to the formerly accepted opinion, the formation of large bubbles of air has been found to be detrimental to the working of the pump, as they tend to drive through the water without doing their share of useful work. The slip of the bubbles constitutes the chief loss of energy in the air lift, varying as the square root of the volume of the bubble.

It is therefore advisable to reduce the size of the bubbles as far as possible, and to this end foot-pieces are now designed to divide the air into fine streams.

Figs. 4 and 5 show two styles of modern air-lift pumps of the "Imperial" type (they are no longer called "foot-pieces"). It will be seen from Fig. 4, showing the "annular" type, that the pump is designed to take advantage of the full cross-sectional area of the well and thus give a maximum flow for a given size of well or bore-hole. The pump proper, which is usually about 8 ft. long, is provided with several rows of holes some distance apart, which are uncovered successively when the pump is started up and remain more or less uncovered according to the relative pressure and volume of the air.

Fig. 5 shows the central air-pipe system and illustrates clearly the method of piping the well. In this type the mixing chamber is considerably larger in diameter than the eduction pipe, so that the air and water are mixed at relatively low velocity and discharged at a higher velocity. The air pipe ends in a long trap to catch any scale or dirt that may be carried through the system. An added refinement, which tends toward a higher efficiency, is the air discharge, from which the cool air is generally piped back to the compressor.

Data Necessary for Calculation

Although it is impossible to construct a formula which will cover all cases, the rule following will enable any engineer to calculate the requirements for any given instance, if certain data covering the case are known. Referring to Fig. 6—

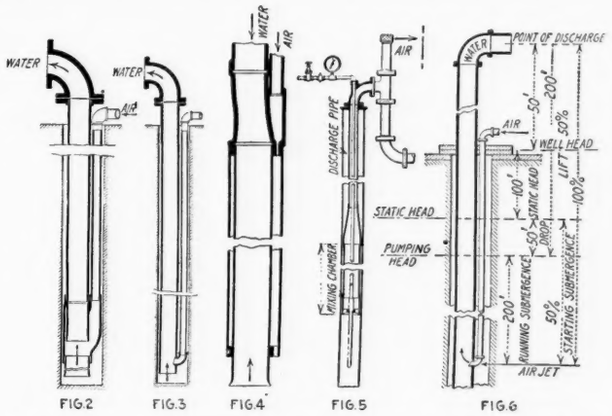
Static head is the distance from the surface of the ground to the standing-water level in the well when not pumping.

Drop is the distance the water recedes when the well is delivering a certain quantity of water.

Elevation is the distance above the surface at which it is desired to deliver the water.

Lift consists of the static head plus the drop plus the elevation.

Submergence is the depth that the air pipe is submerged below the pumping level of the water in the well. There are two classes of submergence—starting submergence, which is temporary, and running submergence, which is the important factor in any pumping proposition. The latter is usually expressed in terms of the total length of the water column from the point where air is introduced to the point of discharge. Thus 50 per cent. submergence means that the total lift, or head, and the submergence are equal. The necessary percentage of submergence varies in accordance with the lift; low lifts require proportionately more submergence than high lifts. As the lift increases the necessary submergence decreases.



FIGS. 2 TO 6. VARIOUS TYPES OF AIR LIFTS AND TERMS USED IN CALCULATIONS

The range of these percentages is found within the following limitations:

For a lift of 20 ft.—66 per cent.

For a lift of 500 ft.—41 per cent.

When the total lift and running submergence are known the following formula can be used to calculate the approximate amount of free air required, and from this the compressor capacity can be figured after making due allowance for the usual losses:

Where

Va = Free air required to raise 1 gal. of water;

h = Total lift in feet;

H = Running submergence in feet;

C = Constant in table below.

$$Va = 0.8\left(\frac{h}{C \log \frac{H+34}{34}}\right)$$

TABLE FOR VALUE OF "C" WITH PROPER SUBMERGENCE

Lift in feet (h)	Constant
10 ft. to 60 ft. inclusive	245
61 ft. to 200 ft. inclusive	233
201 ft. to 500 ft. inclusive	216
501 ft. to 650 ft. inclusive	185
651 ft. to 750 ft. inclusive	156

The necessary pressure can be calculated from the following:

Starting pressure = depth of pump (or foot-piece) in well less the static head × 0.434.

Working pressure = depth of pump (or foot-piece) in well less the pumping heard × 0.434. Friction in pipe = 2 lb. back-pressure in pump.

Since the actual pumping level in a well or a mine is seldom known in advance of a test, it is customary to

assume certain conditions of lift, quantity and submergence, as experience dictates, and design the air- and water-piping accordingly.

It is essential that both the air- and water-pipes be properly proportioned because the velocity of flow is a weighty factor, and it is here that experience plays a most important part. If too large a pipe is used the air finds its way through it without doing work. If too small a pipe is employed there will be excessive friction and inefficient expansion of the air bubbles.

Latest Developments in Air-Lift Practice

Engineers specializing on air-lift work have learned much in the last few years. The proportioning of lift to submergence, thorough breaking up of the air, correct

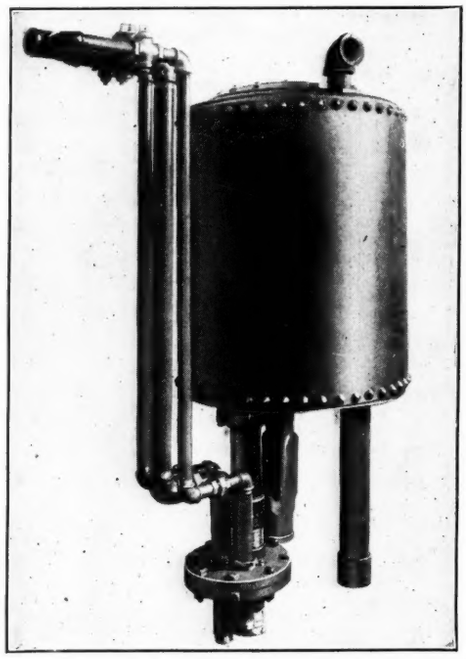


Fig. 7. The Booster to Discharge Water Horizontally

sizes of pipes, long sweeping bends and tees and umbrella discharge pieces to allow the water to flow along natural lines with the minimum of friction are all conducive to higher efficiency, better economy and a greater yield from a given source of supply. Along with these minor improvements have come two which are of real importance: One is known as the "booster," and the other, which is of particular interest to mine operators, is the "compound" air lift.

The booster, Fig. 7, is intended primarily for forcing the water, after it has left the regular air lift, through a horizontal or sloping length of pipe to its final destination. The air lift is economical only when lifting the water in a vertical direction, and if it is to be conveyed some distance horizontally from the source of supply it is necessary to either lift it high enough to allow it to flow to its final destination by gravity or to install some supplementary means, such as the booster, to convey it after it is discharged by the air-lift pump.

The booster simply consists of a closed tank into which the air lift discharges. The air and water separate in this tank, there being sufficient pressure on the air to force the water from the bottom of the tank to its destination. The air escapes constantly from the top of the tank through a restricted opening which maintains the necessary pressure to eject the water. The air discharged is usually piped back to the compressor. The device is extremely simple and forms practically a part of the air-lift pump.

The compound air lift is a recent application of this system to mine drainage. Here a series of short lifts requiring low air pressure are installed in the shaft. Each lift is arranged to discharge into a tank from which the next lift takes its supply. The lifts are low, 11 ft. being considered the most advantageous, since it requires the very low air pressure of 5 lb., which pressure can readily be obtained from centrifugal compressors operated by exhaust steam turbines.

Since there is usually a vast quantity of exhaust steam going to waste around the average coal mine, this form of pump should prove both economical and efficient. Also, since the whole system is designed for only a 5-lb. pressure the piping, etc., can be correspondingly light and cheap; wood-stave pipes can readily be used. The exhaust air from the system should be of considerable aid to ventilation as it would maintain a strong current of air up through the shaft. In the event of a flood the compressor would simply have to be started up and the units above water level would commence discharging, those below coming into action as the water receded. This system has scarcely passed the experimental stage, but offers great possibilities.

In mines equipped with compressed air an air-lift pump can generally be used to advantage. In mines where no air is at hand the air lift has to stand its chance against other methods of pumping, and only a full knowledge of conditions and good engineering can decide between the two.

German Coal in Sweden

Owing to the scarcity of coal in Sweden, says Consul General Ernest L. Harris in *Commerce Reports,* and the great difficulty of getting it at present from England or the United States, Sweden is turning its attention to Germany. It is proposed to import the cheaper quality of coal from Silesia to mix with other coal and coke. A few days ago the Swedish State Rys. purchased 72,000 tons of German coke for delivery at Malmo at a cost of 32 marks ($7.62) per ton. Thus far the total annual imports of German coal into Sweden have amounted to about 200,000 tons.

It may be safely predicted that German coal, as a result of present conditions, will find an increasing market in Sweden. This is especially applicable to German coke, which has the advantage of selling at a lower price and can be imported cheaper than coke from England. The close of the war will find both Germany and the United States competing with England for the coal market of Sweden.

D. A. Thomas does not think the British Coal Mines Act of 1911 has really diminished the danger of underground working. During the last 50 years, there has been an enormous reduction in the rate of fatal accidents and in the death-rate of those engaged in coal mines, but it has not been shown that since this Act came into operation, there has been any decrease. Consumers of coal have been put to the cost of many millions of money, but apparently it has not led to the saving of a single life.

Centrifugal Pumps in Coal Mines

By W. A. Becker*

SYNOPSIS—The basic principle underlying the design and operation of volute and multistage pumps is here explained, as well as many constructional features which experience has shown to be important.

Since the acceptance of the centrifugal pump by mechanical and mining engineers as an efficient and reliable machine for pumping conditions in general, there has been developed in many minds the idea that wherever a reciprocating pump is used a centrifugal pump could be made to replace it. This is of course out of the question. The successful pumping of any heavy, viscous fluid, for instance, can only be accomplished by the use of the slow-moving reciprocating pump.

The question often arises, also, whether the centrifugal pump is applicable for use in coal mines, where the water is usually quite acidulous, containing considerable corrosive ingredients detrimental to cast iron coming in direct contact with it; also, whether the handling of large quantities of water against extremely high heads, as frequently met with in coal mines, could be successfully accomplished by the use of a centrifugal pump. In addition to this mine water often contains much grit and sand, especially where it is necessary to return to the surface the water which has been used in flushing silt, culm and coal dirt into the mine for surface support. This service is quite severe even for a piston or a plunger pump, the sand and grit being extremely sharp, cutting the plungers, pistons and valves and necessitating frequent and costly repairs.

Velocity Is Converted to Pressure

In discussing this subject it becomes necessary first to consider the principle and next the construction and adaptability of centrifugal pumps. The first and most important principle in the design of a centrifugal pump is that of producing the required energy in the form of velocity and then changing this to a pressure head, this to be accomplished with as little shock or disturbance of the water as possible, as shock tends to lower the efficiency considerably.

Fig. 1 shows a sectional view through an impeller in a plane at right angles to the shaft axis. The water enters the impeller at the inner circle A, having an area such that the water has a velocity of from 10 to 12 ft. per second in a line parallel to the axis of the shaft. The impeller vanes usually start on a line with the inlet opening circle or diameter to the impeller shown as D_1. Here the water is picked up by the rapidly revolving vanes and is carried at right-angles to its former direction of flow toward the outer rim of the impeller.

Because of the small angle a which the vane makes with the tangent of the entrance circle D_1, the water enters the vanes with but little increase in speed and with practically no shock or disturbance whatsoever. From this point the velocity of the water is rapidly increased, until it leaves the outer rim of the impeller at circumference D_2, where its maximum velocity is reached.

In order to produce this high exit velocity without causing disintegration of the body of water, the impeller width is gradually decreased on the curve of a parabola from the entrance, which has an area slightly greater than that of the suction, to the width at the rim, which has a total area corresponding to the required velocity of the discharge at this point. Thus the desired result is accomplished with practically no disturbance or shock.

The radial velocity of the water passing through the impeller and designated as V_r on Fig. 1 represents the actual flow of the water, as this velocity together with the width of the impeller at circumference D_2 fixes the capacity. The determination of this V_r, or radial velocity, as well as the required diameter of the impeller when the

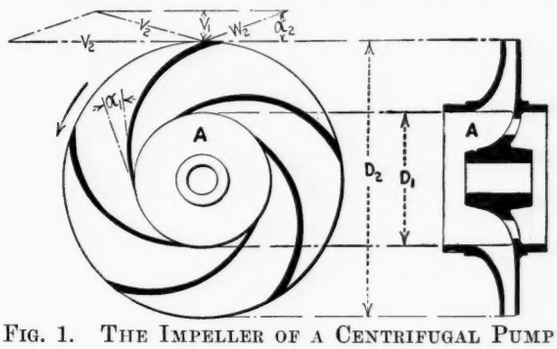


Fig. 1. The Impeller of a Centrifugal Pump

pump is to operate at a given speed against a given head, delivering a given quantity of water, is more or less complicated, and details will not be gone into here.

However, the idea we wish to convey is that the velocity of the water leaving the outer rim of the impeller must represent sufficient energy so that when changed into pressure it would be equivalent to the given head against which we desire to force the given quantity of water. The width of the impeller will under these conditions control the quantity of water passing through it.

Volute and Multistage Pumps

The two most important types of centrifugal pumps are the volute, which may be either single or double suction, with open or inclosed type of impeller, and the multistage or turbine pump, always made with inclosed impellers, either single or double suction.

In the volute pump, the water upon leaving the impeller at the circumference D_2 enters a chamber in the pump casing surrounding it, known as the volute. This chamber is so designed as to have a gradually increasing circular cross-section similar to that of an Archimedean spiral. The cross-sectional area of this chamber (or volute, as it will henceforth be called) is of sufficient size to accommodate all the water from the impeller and allow it to flow through this passage at a considerably lower velocity than that at the rim of the impeller, thereby reducing the energy represented by the velocity at the rim of the impeller to a pressure head in the volute.

The gradually increasing cross-sectional area of the volute allows the water to slow down to about 12 to 15 ft.

*Cameron Steam Pump Works, 11 Broadway, New York.

per second at the discharge of the pump. Beyond this point the velocity is still further reduced by installing a discharge pipe having larger diameter than the discharge opening of the pump. The main reason for thus increasing the cross-section of the discharge is to avoid the excessive frictional resistance in the discharge pipe caused by high velocity, this resistance or loss varying approximately directly as the square of the velocity in any given length of pipe.

In multistage or turbine pumps of the single-suction inclosed-impeller types the individual impellers are designed so as to give practically the same results as the impellers described in connection with volute pumps. Multistage pumps, however, are supplied with two or more impellers, each succeeding impeller raising the pressure of the water an additional 100 per cent. above that attained at the discharge of the first impeller. In this manner almost any pressure within reason can be produced by simply adding a sufficient number of stages.

The water upon leaving the first impeller must be returned to the entrance of the second; hence the elimination of the volute in this case.

The method of efficiently transforming the kinetic energy of the water at the rim of the impeller into pressure, as well as changing its course from a rotary to a radial direction before it is caused to flow back to the entrance of the second impeller, has always been a subject open to discussion or argument by designers and manufacturers.

The Diffusion Vane

One method, employed by the A. S. Cameron Steam Pump Works and several other concerns, is the introduction of a stationary diffusion vane ring around the outside of the impeller. This ring is designed so as to perform the above-mentioned function—to convert the kinetic energy of the water at the time it leaves the impeller into pressure by the time it reaches the outer rim of the diffusion ring. The vanes in this ring are designed to suit the diameter and form of the impeller. Their ends, where the water enters, are tapered to a sharp point and are set at such an angle as to receive the water in a straight line as it leaves the impeller parallel to the absolute velocity V_2, as shown on the diagram, Fig. 1.

This V_2 is considered to be the actual direction of the flow as the water leaves the impeller and is determined from the relative velocity W_2, which is tangent to the curve of the impeller vane at the rim, the circumferential velocity U_2 tangent to the rim of the impeller, and the radial velocity V_r.

The water passageways between the diffusion vanes are designed to have a gradually increasing cross-sectional area, and in addition the outlet is formed so as to divert the flow of the water to a radial direction. From this point the water enters a large chamber, at a low velocity, but at an increased pressure. Here its direction is reversed by the walls of the casing, and it is caused to flow through another stationary compartment known as the channel ring, which is really only a flat, smooth surface supplied with radial vanes to guide the water and cause it to enter the second impeller in the same direction and manner as it entered the first, but under a pressure equivalent to that produced by the previous impeller.

Most diffusion vane pumps are supplied with a diffuser in each stage. In the Cameron pump, however, the impeller of the last stage discharges directly into a volute, which is generally considered the most efficient method of converting the kinetic energy of the water into pressure. The only reason that it is not used on each stage of the pump is that the direction of flow is radically different on the last stage from the others.

Some multistage pumps have no diffusion vanes whatsoever. Here the water discharge from the impeller at high velocity naturally strikes the walls of the casings with considerable force where it makes the abrupt turn of 180 deg. to enter the second impeller, and when grit or sand are present this has a tendency to wear the casing and gradually weaken it.

The water also has a rotary motion, causing a centrifugal force, which must be overcome when the water is forced back through the channel ring. This causes loss. This latter type of construction, however, has its advantages over the diffusion vane type in that it has fewer parts, is simpler in construction and cheaper. The disadvantages of the diffusion vane type are that the vanes must be designed for each particular working condition, they require much machine work, and consequently are more expensive to build.

Grit Wears Away the Casing

When a pump is handling water containing sand or grit the points of the vanes (if the casting is made of iron or ordinary bronze) will gradually wear away, which will result in disturbances in the water at this point, thereby causing losses. In order to prevent this erosion the diffuser in each case is made of extra hard government phosphor bronze, which experience has proved to be capable of withstanding quite successfully the effect of a certain amount of grit and sand at high velocity.

In the double-suction impeller type of multistage pump, so designed as to secure a nearly perfect hydraulic balance, the waterways must be so proportioned as to give a tortuous passageway to the water at fairly high velocities. This often defeats the real purpose of this type of design. There are, however, quite a few successful double-suction turbine pumps on the market. They have been used quite extensively as boiler-feed pumps in connection with steam turbine drive, as this type of impeller with its small inlet diameter can be made correspondingly smaller in its outside diameter, and therefore adapts itself to rotative speeds from 15 to 20 per cent. higher than the maximum speeds for a single-suction regular type impeller pump.

To make a multistage pump having more than three or four stages, the shaft must be large in order to be of sufficient size to prevent undue deflection, and in such cases where the heads against which it is desired to pump would require five or more stages, it is always advisable to consider using two multistage pumps in series. While this construction requires more room, as well as having possibly a higher initial cost, the efficiency of the entire unit remains more nearly constant over a given period of time. Furthermore there is less expense for repairs.

A thrust bearing is almost always supplied on multistage pumps in order to take care of the unbalanced end-thrust, as well as to keep the impellers and diffusion vanes in proper axial alignment. It is also quite frequently supplied on double-suction volute pumps working against heads upward of 100 ft. or on high speeds, so as to prevent axial drifting of the shaft back and forth due

to slight pressures building up alternately on each side of the impellers.

The Marine Thrust Bearing

The most common form of thrust bearing used in connection with centrifugal pumps is the marine type, so called from being used in taking up the thrust on ship propellers. This bearing consists of a series of carefully cut collars on the end of the pump shaft, forming the outboard bearing. It is sometimes made up of a series of hardened and ground steel thrust collars fitted over the end of the shaft, which is turned down to receive them and all held in place by means of one long feather key. These collars are equally spaced by the use of small steel thimble separators.

Of the two methods mentioned for making this thrust bearing the latter is preferable, as in case one of these collars breaks or if through improper attention the bearing should burn out it would be necessary only to replace the collars, whereas if they were cut directly on the shaft itself it would mean a new shaft.

The casing surrounding the marine thrust bearing is usually supplied with a water-cooling jacket, the cold water carrying away the heat generated by the thrust collars. This water jacket is connected by small piping to the discharge side of the pump and exhausts through another small pipe into the suction of the pump.

This type of bearing will give trouble if the shaft should be sprung out of alignment, if each collar is not continuously supplied with clean oil or if the shaft is so light as to allow vibration. With reasonable attention, however, and with present uptodate machine-shop methods for turning out a first-class job, this type of bearing has, with a limited number of exceptions, proven itself quite successful.

Another method of counteracting thrust is through the use of a hydraulic balancing device. This is made in different forms, but all operate on the same principle. It consists of a disk mounted on and rotating with the shaft and placed inside the casing immediately after the last impeller of a multistage pump. The disk is made of ample diameter to allow sufficient area for the pressure of the water leaking by the bushing rings behind the last impeller to act upon and counteract the thrust in the opposite direction.

This balancing device operates quite successfully on pumps where the discharge head always remains constant, but in cases where this pressure is liable to change at any time, or if the pump is started up without priming, the disk is liable to touch the casing. The result is that at the exceedingly high surface velocity employed the two parts are liable to "freeze fast" in a few seconds and wreck the pump. This is one of the most serious objections to the hydraulic disk balancing device.

A Casing Split Horizontally Is Advantageous

The horizontally split casing on volute and multistage pumps facilitates repairs or examination of any part of the interior. In this type the suction and discharge nozzles are cast integral with the lower half of the casing and need not be disturbed when removing the top half.

In discussing the adaptability of the centrifugal pump to meet various conditions, we will consider the different types of this machine and the conditions under which they can be used successfully.

First, the open impeller pump, which is extremely simple in construction. It has no bushing or wearing rings to seal the impeller against slippage, but the casing is made to fit close to the impeller with very little clearance. For this reason this type of pump is not good for much higher heads than 70 ft., as beyond this the pressure becomes so great as to cause water to slip by the impeller back to the suction. The simplicity of design and the absence of wearing parts in contact with the water make it an ideal pump for handling water containing much sand or grit or even for fluids that are more than ordinarily sluggish, as there is little chance for the pump to clog. This type is least efficient of any of the centrifugal pumps, but is best adapted for rough usage and the handling of dirty, gritty water or even sewage, providing the head does not exceed the 70 ft. as before mentioned.

Second, the inclosed impeller volute pump, double-suction type, which is more refined in its construction and also more expensive than the open impeller type. This pump is usually built for heads as high as 200 ft., and sometimes as high as 230 ft. per single impeller. These extremely high heads, however, require high speeds, unless the impellers are made exceptionally large. In this case, however, it is ofttimes found that the standard casings as built by American manufacturers are too small to allow the use of a very large impeller for high heads or ordinary low speeds. This is due possibly to standardization for manufacturing purposes.

These pumps are quite adaptable for coal mines in handling either pure, acidulous or gritty water. When handling pure water the impeller can be made of cast iron. The shaft sleeves and impeller bushings or wearing rings are always made of bronze. When handling acidulous water the impeller should be of bronze, while if the water is extremely acidulous the entire casing, and in fact all parts coming in contact with the liquid, should be made of acid-resisting bronze. When these precautions are taken, this type of pump will handle acidulous water quite as successfully as fresh water. When the liquid is gritty the impellers should be made of hard phosphor bronze in order to prevent wear. The efficiency of this type of pump ranges from 65 per cent. on the 3-in. size to 75 per cent. or even 80 per cent. on larger sizes, say 10-in. to 12-in. and over.

Third, the multistage or turbine pump, which operates on much the same principle as does the inclosed-impeller volute pump. Each impeller in a multistage pump can be made to operate against a 200-ft. or even a 230-ft. head; and a multistage pump with four impellers, each designed to operate against, say, a 200-ft. head at a given constant speed, will discharge against a total head of 4×200 ft., or 800 ft.

This type of pump will operate successfully when handling either fresh or acidulous water, providing the material of which the impellers, diffusion vanes and casings are made is capable of withstanding the corrosive action of the water being handled.

Centrifugal Pump Is Adapted to Coal-Mine Service

The centrifugal pump, because of its simplicity, durability and reliability, has proven itself to be almost ideal for use in coal mines. It requires but little head room and floor space; it can be direct-connected to an electric motor, and it is practically immune from the effects of coal dust on the bearings, which are all totally inclosed.

This latter is in marked contrast with electrically driven reciprocating pumps.

There are only two bearings on the pump and two on the motor, and all are of the ring-oiling type with large oil reservoirs, which require filling about once a week. There is practically no packing trouble in comparison to reciprocating pumps, as the only movement of the shaft on a centrifugal pump is rotary and not axial.

It is always well to remember in selecting a centrifugal pump for coal-mine service, which service is usually severe, that the cheapest type or the cheapest pump is not always the best investment, as the very best of machine work is required in order to turn out a properly aligned and efficient centrifugal pump.

Extracts from a Superintendent's Diary

There are days when I enjoy every minute of the time spent at my office—today has been such a day.

At 6:30 my office-boy called me on my residence phone to tell me that a pit committee was waiting to see me at the office. I hurried over, knowing that the committee had made the early start that they might finish their business with me in time to enable them to go to work. This meant that they did not want to lie around all day and charge their time up to the miners, which they have a perfect right to do.

Within ten minutes after my arrival we came to an understanding, and the committee went on its way smiling. I had a kindly feeling for the committeemen because of the consideration they manifested for the miners they represent; they had a kindly feeling for me, realizing that I had come to the office nearly an hour before office hours. How easy it is to come to an understanding when there is good-feeling and esteem between adversaries.

Just after the committee left, my office-boy sidled in and asked for a half-day holiday. He wished to attend a ball game, but he didn't say so.

"Why were you here so early this morning, Tom?" I asked.

His countenance fell; he had figured that I would grant the holiday as a reward for his having been at work so early, but the expression on my face made him fear that I had discovered that his early arrival had been accidental and owing entirely to a crazy clock that wouldn't keep time.

His disappointment was so keen, however, that I weakened and granted his request. His victory following apparent defeat made us both smile.

About 10:30 our general manager called me by long-distance telephone to tell me that our sales manager had just closed a contract for enough coal to insure us five days' operation per week in place of the four that we have been running. Incidentally he remarked that we got this new contract in the face of keen competition, largely because our coal has the reputation of being more carefully prepared at the mines than other coal from our district. For several years I have realized that our coal is the best-prepared coal in our district, because I have kept close tab on all of my neighbors, but never before has our general manager admitted as much. I smiled at him; what a pity he couldn't see the smile!

About 3 o'clock Mr. Styles, the assistant state mine inspector in charge of the mines of our district, came into my office, having finished his quarterly inspection of our mines.

"Mr. Thompson," he said, "if all of the mine foremen in the state would carry out the instructions that we inspectors feel called upon to make, in the same spirit that your foremen do, the inspector's job would be one of the most pleasant imaginable. But you'd be surprised if you could see the treatment most of the foremen give us. Every criticism that we make is resented, and if we make a suggestion that reflects in the least upon their management, they get busy to see if they can't find something in our past history that might assist them to discredit us. We realize that the superintendents are responsible for a good deal of this feeling, because if they didn't encourage their foremen the foremen would soon change their tactics."

Flattery perhaps, but it started me home from the office grinning from ear to ear.

English Trade Difficulties

The war has brought about a noticeable increase in cost of production in the colliery industry of both Bristol and the Forest of Dean district, says Consul J. S. Armstrong, Jr., in *Commerce Reports;* and in spite of the high prices now obtained, which range from 30s. ($7.30) to 32s. ($7.79) per ton, there has been a considerable reduction in profits. There has been a shortage of labor at the collieries owing to enlistment, and a consequent reduction in output to the extent of 33 to 50 per cent.

At the annual meeting of one of the leading colliery companies of this district (Bristol) the following statement was made:

During August and September the British Admiralty was making abnormal demands upon the collieries, and this tended to disorganize the ordinary trade. Later, when the naval requirements abated, there was some delay in the resumption of ordinary trade occasioned by difficulties to be confronted by consumers in obtaining transportation facilities.

Other important factors in the increased cost of coal have been higher freight charges and the shortage of pitwood.

The report of the committee appointed by the British Government Board of Trade to inquire into the causes of the present rise in the retail price of coal was published recently. The recommendations are:

Exports to neutral countries should be restricted.

Steps should at once be taken to consider, in consultation with the public bodies concerned, the question of the accumulation by such bodies of reserves of coal in or near London for the use of small consumers during next winter.

The rates of freight on interned steamers should be further reduced.

Suitable enemy ships condemned by the prize court should be taken over by the government and used for coal transport.

If prices do not shortly return to a reasonable level, the government should consider a scheme for assuming control of the output of collieries during the continuance of the war.

The committee in its report, which it explains is concentrated mainly upon London, states that recently large quantities of inferior coal which in ordinary times would find no market in London have been supplied to the consumer, under one designation or another, at very profitable prices.

For every ton of coal raised from one of the anthracite mines, the operators of that field are obliged to pump to the surface about 11 tons of water. It is estimated that in the anthracite mines, there are 900 pumps in use at the present time. The capacity of these pumps is approximately 1,000,000 gal. a minute.

A New Sinking Pump

By Alden W. Baldwin*

SYNOPSIS—The ordinary type of sinking pump is suspended in the shaft by a cable and must be raised whenever a shot is to be fired. This new pump works in a borehole beside the shaft, the power head being placed on the surface out of harm's way.

The earliest point where water may hinder development in coal mines is in shaft sinking. In some cases the strata penetrated are so formed that the water may seep away and the shaft be thus self-draining. If this is not the case some mechanical means must be provided for delivering the water at a point sufficiently removed from the shaft opening, so that it cannot interfere with operation. For this purpose the sinking pump, or "sinker," was especially designed and built to meet the severe conditions encountered in this service.

Sinking pumps may be either steam or electrically driven, the steam pump being the earlier type and the one which is more extensively used, even at present. Successful steam pumps long antedated the electric-driven machines. Furthermore, they would stand much harder usage than the earlier models of motor-driven pumps.

There has not been (until comparatively recently) a wide application of electricity to mining work. During the past few years, however, progressive pump manufacturers have developed successful motor-driven sinkers, which are now recognized as more satisfactory in many instances than steam sinking pumps.

From the nature of the work to be performed, the pump must be so supported that it can be easily raised and lowered in the shaft. It must always be kept within suction reach of the water when at work and must usually be raised a considerable distance above its normal working position when shots are to be fired. These requirements make it desirable that the sinker be not too great in weight or size for hoisting by cables and for easy handling.

All sinking pumps must be substantially built, so that they may operate for long periods without danger of failure, and this, too, with a minimum of attention. They must be provided with sufficient covers or inclosing shields so that flying débris, in case a shot is fired or a tool carelessly allowed to fall into the shaft, will not be likely to cause damage. In these respects the steam pump, with its compact design, appears to have the advantage, but properly designed electric machines have repeatedly proved their worth when tested under the severest service conditions.

It is difficult to give figures when comparing the relative economy of the two principal types of sinking pumps. It is not necessarily the efficiency of a machine that determines the value of either type under given working conditions. Of the two types, the electric sinking pump is doubtless the more efficient.

Ordinary Sinkers Have Many Disadvantages

It is evident to all practical mining men that at its best neither form of sinking equipment mentioned is what is really desired. Hauling the pump up in the shaft out of harm's way every time a shot is to be fired delays operation. This delay is only partly obviated if the pump is allowed to remain near the bottom, behind a rough shelter of timber. Furthermore, a pump that cannot be harmed by submerging for a considerable time would prove a great advantage in situations where flooding is liable to occur. Recently, a pump for use in shaft sinking has been introduced which combines the high efficiency of the ordinary triplex plunger machine with the ability to overcome the conditions mentioned above. This pump is entirely new in principle as applied to mining work, but the application of machines somewhat similar in design has already proven successful in a number of instances.

The pump referred to is the Glendora triple-plunger deep-well pump, designed to lift water from considerable depths by means of a working barrel placed in the water near the bottom of a borehole. This barrel, or cylinder, contains three plungers, operated by long rods driven by a power head at the surface of the ground. The borehole in which the pump operates may be placed adjacent to, but just outside of, the side of the shaft that is being sunk. The barrel may be placed down as far as it is intended to carry the shaft, or it may be found preferable to move it down occasionally as the sinking progresses.

Accumulated water in the shaft may be admitted to the borehole at intervals by punching through the intervening strata so that the water can drain off, it being then forced from the bottom of the borehole through the column-pipe to the top. In some instances it has been found unnecessary to make these drains connecting with the pumping equipment, the strata being such that drainage of the shaft takes place through fissures in the rock. Other developments have been handled by putting down two borings—one, as described above, close to the outside of the shaft and another in the shaft itself. In this way the water in the shaft drains through the hole in the floor and is delivered to the pump through underlying strata sufficiently porous to allow the passage of water from one hole to the other. Care must of course be taken to keep unobstructed the hole in the shaft.

The Pump Head Is Gear-Driven

The power head of the Glendora pump has a gear-driven crankshaft supported in bearings on a heavy frame; also five connecting-rods transmitting motion to three crossheads which move up and down in guides in the frame casting.

Although there are five crankspins and five connecting-rods, the pins are not spaced equally around the crank circle. The center crankpin makes an angle of 120 deg. relative to the two which are nearest it on either side, these two being on a common center line with each other. They, in turn, are at an angle of 120 deg. with the two pins nearest the end of the crankshaft, which also have a common center line. The outside connecting-rods move up and down together, as do also the second pair of connecting-rods.

The working barrel contains three plungers, one above the other, operated by means of long rods which transmit

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the driving power from the pump head at the surface. These rods comprise a central solid rod inside of a tube, or pipe, which is itself inside of a second tube. The end of the solid rod is attached to the lowest plunger, its upper end being actuated by the center crankpin at the power head. The lower end of the intermediate rod, or the one within which the solid rod works, is attached to the middle of the three plungers and is driven up and down by the two cranks next to the center crank. The upper plunger is driven by the outside one of the three rods, the upper end of which is attached to the lower crosshead. It is driven by the outside pair of cranks.

Each plunger has a heavy bronze valve seating upon its top: Each valve seats firmly upon the up stroke, unless the plunger above or the one below it is lifting or forcing water through this plunger. Thus, as each plunger reaches that portion of its stroke in which it is moving at a greater speed than the other ascending plunger, its valve will seat gently and assume the load of the water column. As the speed of this plunger gradually decreases another is attaining maximum speed, and this in turn assumes the load when its valve closes, thus allowing it to lift water through the plunger below it by means of suction or force water through the one above.

Each plunger carries the load of the water column for only a portion of its up stroke, or while moving at or near its maximum speed. Thus, the water in the column-pipe is kept moving continuously and smoothly at the highest allowable velocity. This is in decided contrast with the operation of the common single- or double-acting working valve usually employed and results not only in high efficiency, but also great reliability, the rods and power head being relieved from the shocks which are inevitable in pumps requiring the overcoming of the inertia of the water column at the beginning of every stroke.

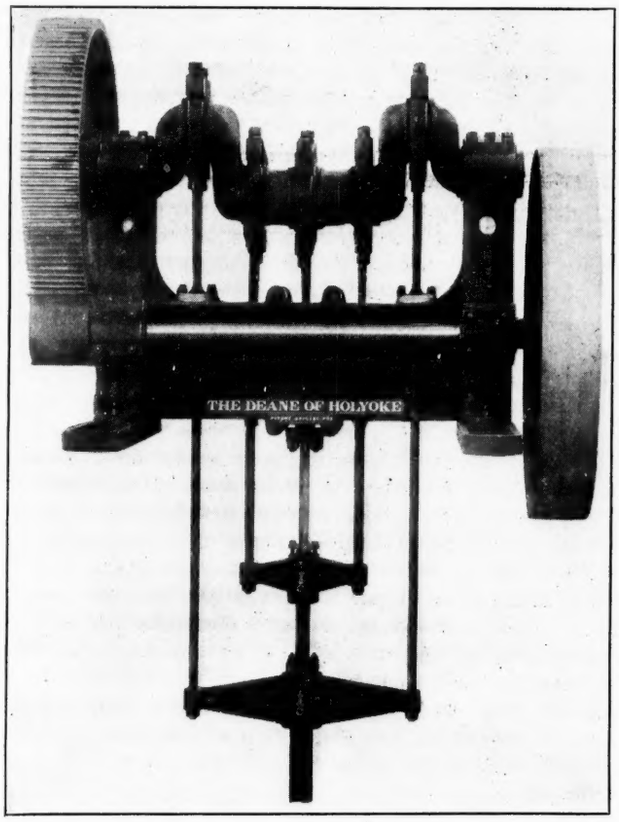
The Pump Is Efficient in Power Consumption

The superiority of the triplex electric sinker over the duplex steam pump as regards efficiency in the use of power is maintained in the pump above described. The three plungers are operated by cranks set 120 deg. apart, and a smooth flow of water tends to give the best results. Every acceptance test of this pump has shown an efficiency of 80 per cent. or better for the pump alone.

But this high efficiency is not the only advantage to be found when the pump is employed for shaft sinking. Much time is saved in keeping the pump at work regardless of the firing of shots. There is no need of hauling the pump up out of the way or of putting up timbers to keep it from damage by flying rock. It is shielded by a wall of solid rock as thick as may be desired. The time saved in sinking a shaft by the use of the deep-well type of pump has been still further increased by the fact that larger charges of explosives may be used without endangering the operation of the pumping equipment.

The water end of any mine pump must be able to withstand the grit always encountered in this service. This is especially true of a sinking pump. The design and construction of the Glendora working barrel render it capable of long-continued operation with a minimum of wear. It is also easy of inspection and repair and will handle grit with less trouble than many other designs. On account of the continuous upward movement of the water column, the flow causes all grit to be carried along through the plungers without chance of its being deposited on the valves or their seats, as might be the case if the flow was stopped at the end of every stroke. The leather cup packing around the plunger is easily renewable at slight expense.

When such a pump is installed for sinking purposes the working barrel need be placed only so far down as to insure keeping the operation free from water for a given period. After the sinking has progressed as far down as the water end of the pump, this may then be put still further down in the borehole. In this way the pump becomes a first-class station pump after the shaft is finished.



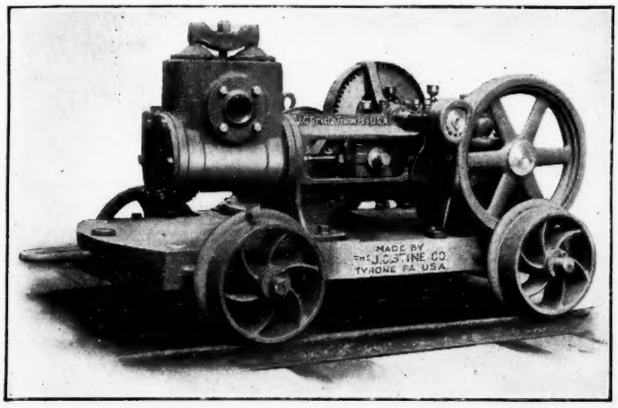
The Pump Head Showing Five Connecting Rods and Three Pump Rods

If at some future time further development is necessary the borehole may be sunk deeper and the necessary length added to the column-pipe, the pump being then ready to keep the new part of the shaft free from water, while sinking and for draining the lower levels when they are completed. As a station pump this has an advantage over other types, since it can never be flooded out, as the power is applied to it at the surface of the ground and the only part in the mine works better if below normal water level.

The Glendora triple-plunger pump has been designed and patented by the Deane Pump Co., Holyoke, Mass., by which company is has been manufactured for some time. It is built in a number of sizes for 100 hp. or less and for capacities ranging from 150 to 3000 gal. per minute.

A New Portable Pump

One of the most annoying problems around coal mines is the elimination of water from the working-face of the rooms or entries where these are not self-draining. In such a case it is necessary to install some kind of a pump, usually known as a gathering pump, to transfer the water from the working-face to some central point where a large pump may eject it from the mine.



THE PUMP ON ITS TRUCK

Such a gathering pump as manufactured by the J. C. Stine Co., of Tyrone, Penn., was described on page 380 of COAL AGE for Feb. 27, 1915. More recently, however, another improvement has been added to this pump. This consists in making the bedplate of the pump the platform of a truck which may be made to fit any gage of mine track and is provided with removable truck wheels.

As a gathering pump is of necessity temporary in its nature and used in one place for only a short time, this feature of building the bedplate as a truck will be at once appreciated by mining-men. The pump may thus be readily transported from one portion of the workings to another and blocked in place on the track while a place is being pumped out or it may be removed from the track and blocked in position on the mine floor. In case the pump may be wanted in one position for any considerable length of time, the wheels of the truck may be removed and laid to one side and the bedplate mounted on a light foundation in the usual manner. It will thus be readily seen that the truck bedplate adds the feature of flexibility to a piece of equipment the utility and reliability of which have already been clearly demonstrated.

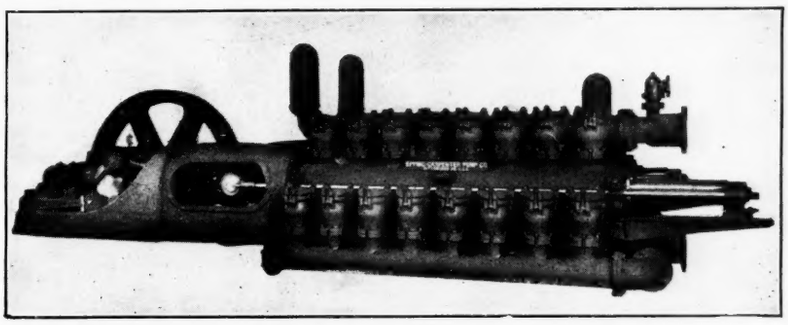
High Efficiency in Mine-Pumping Machinery

The use of electricity for power distribution in coal mines is increasing so rapidly that the necessity of keeping the cost of current at a minimum is receiving the most careful attention. Among other equipment in which a marked saving is possible the mine-pumping machinery assumes an important place; and to secure such a saving the adoption of pumps of the highest possible mechanical efficiency is necessary.

The accompanying illustration shows a mine pump of high efficiency. This machine was built by the Epping-Carpenter Pump Co., of Pittsburgh, Penn., and represents the standard practice of this builder. This machine is a horizontal duplex double-acting unit, having plungers 8½ in. in diameter with a 24-in. stroke. The pump is of the direct-flow pattern, and is guaranteed to deliver 1000 gal. per min. against a total head of 800 ft., with an efficiency of 88 per cent. Machines of this type are also built in 36-in., 42-in. and 48-in. stroke, with guaranteed efficiencies ranging from 90 to 92 per cent.

A study recently made, in connection with a certain coal-mine installation, of the relative costs of power for reciprocating and centrifugal pumps showed that the saving through using the reciprocating in preference to the centrifugal type of machine would pay for the difference in cost between the two in from 1½ to 2 years.

It will be noted that in the design of the pump here shown many features are embodied tending toward high efficiency. Among these might be mentioned the following: The direct flow of the water through the pump; that is, no reversal of flow, which eliminates shock and consequently secures a rounding-off of the peaks on the amperage curve. The use of leather-faced pump valves, and of cut herringbone gears, pinion and pinion shaft being made from one forging. Four-part adjustable main bearings; the bearings provided for the pinion shaft, are ring-oiling and made with removable shells. They are adjustable as to position, insuring perfect parallelism of gear and pinion teeth. The shafts are supported in two main bearings, securing perfect alignment. All bearings are unusually large, while the frames are in one piece, resting upon the foundation throughout the entire length.



THE POWER-DRIVEN DUPLEX PLUNGER PUMP

The pump illustrated herewith is installed in a mine where the water is unusually good. The same type of machine is, however, manufactured with complete wood lining for installation where bad mine water, such as is encountered in many localities in western Pennsylvania, is to be handled.

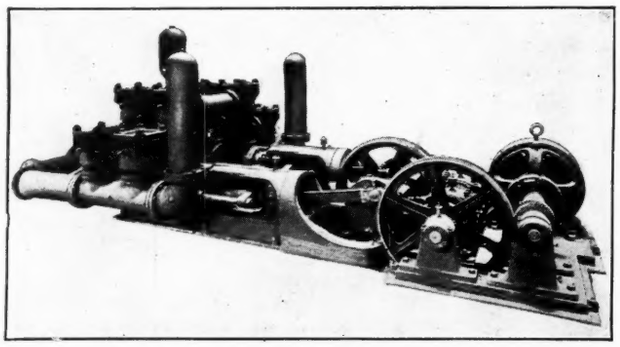
If an alternating current be transmitted through a conductor, portions of the electric energy supplied may be transformed into heat in four different ways, each resulting in an energy loss and in a corresponding reduction of the current-carrying capacity. These losses are: the energy required to overcome ohmic resistance, a loss of energy due to skim effect, foucault or eddy currents and dielectric hysteresis losses in the insulating material. While the amount of heat developed under ordinary service conditions by any one of the last three mentioned causes would probably be small, the aggregate amount tends to increase the temperature of the conductor, which increases its resistance, reduces its carrying capacity and shortens the life of the insulation.

Wood and Lead Lined Coal Mine Station Pump

The accompanying illustration shows a duplex double plunger electrically driven mine station pump of the wood and lead lined pattern built by Boyts, Porter & Co., Connellsville, Penn. The size of this machine is, plungers, 10 in. diameter, 12 in. stroke, piping 12 in. suction and 10 in. discharge. It is operated by a 75-hp. Westinghouse 230-volt d.c. motor, through double-reduction cut herringbone gears of the Falk type.

This type of pump embodies the practical experience of over 45 years in dealing with mine pumping at first hand. It is built heavy and strong and of the best grade of material, the bronze employed being especially prepared for resisting the action of mine water.

All portions of the entire water end of the pump are protected by wood lining wherever possible. Where this is impossible—as for instance, in the case of the neck of valve chambers and the lids therefor—it is protected by lead cast solid to these parts. The result is a pump which is extremely durable and one which will resist the action of mine water for a long period of time.



RECIPROCATING PUMP WITH DOUBLE-REDUCTION HERRINGBONE GEARS

Before the present method of wood lining pumps was evolved, an entire water end of bronze was the only type that would endure. This was extremely expensive. The writer recalls some of the larger sized pumps installed in the Connellsville region with bronze water ends which weighed approximately 7½ tons. The mine water here encountered was so strongly acidulous that a cement lined water end would eat out. Enamel also proved useless in protecting cast-iron parts.

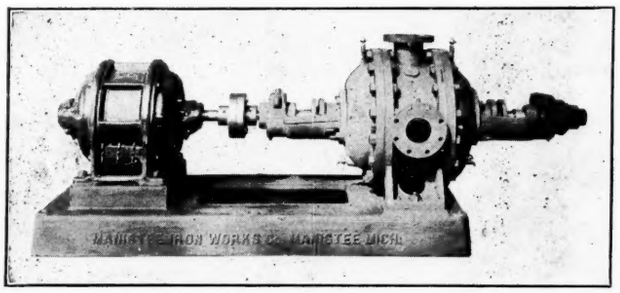
The lining of pumps with wood met these conditions admirably, not only securing greater durability and saving in repairs and attention, but also in first cost, and has proved beyond doubt the advantages of the wood lined type of pump in many years of constant service.

The demand for electrically driven mine pumps is fast exceeding that for those of the steam- or air-driven type. Many of the older mining operations have electrified, thereby effecting a considerable saving in the cost of pumping. This has been shown by test.

A recent test made to show a comparison of cost between electrically driven pumps and the old system of steam- or air-driven machines showed a reduction from 750 tons of boiler coal per month with three shifts of firemen, three pumpers and three assistants to 300 tons of coal per month with one pumper and two firemen. Furthermore, there was a decided increase in output.

A New Type of Centrifugal Pump

As centrifugal pumps are ordinarily built, an impeller is employed for each stage. The Rees Roturbo multistage pump employs the principle of impellers in series and has one-half as many impellers as there are stages. Each impeller has a double eye and answers for two stages. Because of this fact it is possible to reduce the overall dimensions of the machine and at the same time obtain a perfect hydraulic balance or neutralization of end thrust by means of conducting the water from one stage to the next in a proper manner.



A SINGLE-IMPELLER PUMP

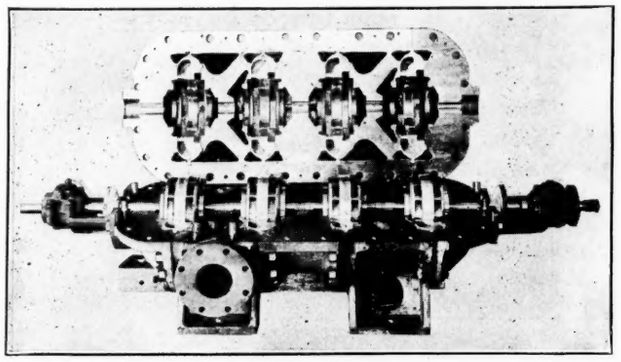
The impellers are of bronze or cast iron, fitted with renewable eye-rings which mate with renewable casing-rings, both being internally lubricated by water under pressure.

A flat bridge between the stages of each impeller eliminates leakage. The impellers are keyed to the shaft and held in position longitudinally by means of bronze sleeves which cover and protect the shaft and are keyed to and locked upon it, thereby holding the impellers securely in position.

Each diffuser is of such a type as to contain the diffusing passages of each impeller; thus two diffusers are really combined in one, the overall dimensions being thereby reduced.

The pump shaft and impellers are supported in two bearings lubricated by double oil rings, while the bearings are supported on brackets on either head of the pump and are external to the casing. The glands are ample in size and are sealed by water under pressure.

The standard casings are sufficiently heavy to easily withstand any stress to which they may be subjected. They are split vertically and all water joints are made tight by lead packing. In the tail-bearing bracket is placed a



MULTISTAGE PUMP WITH TOP OF CASING REMOVED

two-way ball thrust, which serves the purpose of keeping the impellers in line with the diffusers.

Pumps of this type obtain a high efficiency over a wide range. This range generally extends from 50 to 70 per cent. on either side of the normal duty point, without dropping over 5 per cent. from the highest efficiency.

The chief reason for this high efficiency over a wide range of duty is the fact that the impellers, being drums or reservoirs of considerable size, have a capacity such that the water passing through them moves slowly. This reduces the friction in the impeller without the necessity of polishing its inner surfaces.

This slow movement of the water through the impellers and other passages of the pump has many advantages, chief among which is the fact that under these circumstances the abrading or wearing away of the impellers, casing and diffusers is much less when handling gritty water or that containing sand than in pumps where the water velocity is high. Under these circumstances the normal efficiency of the pump is maintained over a considerable period of time.

A Gathering Pump Embodying Some New Ideas

Although the initial outlay in one gathering pump is comparatively small, it should be considered as important, as in most cases it is necessary to use a considerable number of these machines scattered about the mine. For this reason, the investment should be considered not as applying to a single machine representing a small amount, but as applying to a number of pumps amounting in the aggregate to a large sum.

The extent to which a mine depends upon the gathering pump should impress the manufacturer with the importance of designing and building such a machine for service rather than to sell at a low price. The extent of development and the rate at which it may be carried on are largely dependent upon the service rendered by the gathering pump. If working-places cannot be kept dry, too great a number of such places are required in order to secure a given production, and the development cost becomes excessive. On the other hand, if water cannot be kept away from the faces in advancing headings, the development is slow, and not enough working-places can be secured to insure a given tonnage.

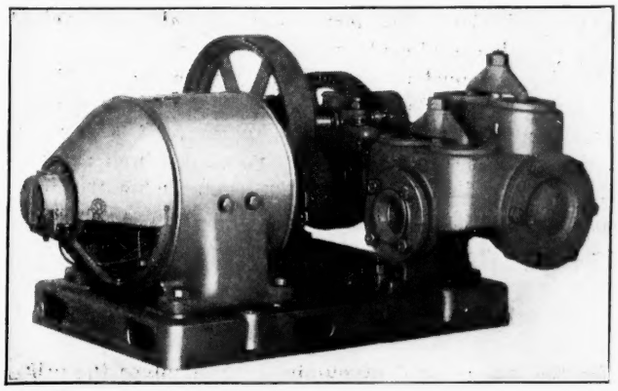
It is therefore of first importance that the gathering pump employed should be reliable in every particular. Next to reliability it should be obtainable at the lowest price consistent with known quality.

A pump that has been designed and is being built with this idea in mind has been recently placed upon the market by the Pneumelectric Machine Co., of Syracuse, N. Y. Some features of unusual interest have been embodied in its design.

There has always been a divergence of opinion among mining-men as to what constitutes the most desirable features for pumps of this kind. In order to ascertain what ideas were most commonly held concerning the various points to be taken into consideration in the construction of such a pump, many practical as well as scientific mining-men were consulted, and the pump as now made represents the composite of ideas thus secured.

Advantage has been taken of the careful study and practical application of the use of different alloys and the special heat treatment thereof in order to produce parts of the greatest strength and longest wearing qualities. The material used for each individual element has been selected, therefore, particularly for the service which it is to perform, both with respect to strength and wearing qualities. Simplicity has also been carefully studied, so that but few parts are employed, all of which are easy of access, both for examination and replacement. In addition to this the method of oiling and lubrication is unusual and has proved to be quite satisfactory.

The pump is of the piston type, with a stuffing-box of ample size and easily accessible. The piston design has been carefully worked out, and no small bolts or tapped holes which are liable to corrode have been employed. All studs in the cylinder are anchored in bottomed holes in order to protect them from the effect of acidulous water. The pump lining is pressed into the bore, thus eliminating the necessity for screws, while all openings and water passages are exceptionally large, allowing the water to flow through the pump with but slight resistance.



THE PUMP AND ITS DRIVING MOTOR

All bearings are of bronze, so that their replacement or repair may be accomplished without removing the pump from the mine. All bearings are lubricated by a felt wiper oil reservoir system. This entirely eliminates the use of oil cups or other devices which may require attention at the time of starting or stopping the pump. Reservoirs are cast into the frame at points near the bearings, with openings leading thereto. These openings are provided with wicks, so that oil is fed to the shaft only at such times as it may be in motion. These reservoirs are carefully covered to prevent the entrance of dirt, but are easily accessible and may be readily cleaned.

The crosshead guides are also lubricated from an oil reservoir cast into the frame. The connecting-rod is provided with a suitable oil reservoir, which is connected to each bushing by channels through which the lubricant is forced by the splashing caused in the reciprocation of the rod. Felt wicks and grooves cut in the bushings distribute the lubricant uniformly and to a proper amount over the bearing surfaces.

This system of oiling not only results in economy, but also insures the proper lubrication of all surfaces with the least amount of attention, and is consequently a highly desirable feature in connection with a machine of this kind that must be employed at distant points and frequently started and stopped without having an attendant make certain that it is in proper working condition

In order to make it possible to start and stop this pump without the necessity for a man going to it, a motor is employed which can be thrown directly onto the line without the necessity of a starting resistance. It is therefore possible for the pump to be started by simply throwing a switch in the power house or at any other convenient point in the mine.

In many cases the use of acid-resisting materials in the water end of the pump becomes necessary on account of the strong acidity of the water encountered. Special attention has accordingly been given this point, and an acid-resisting material of high quality has been secured from which to construct the water end. The pump has been operated in some of the strongest mine water to be found, and the results have been highly satisfactory. The material employed has fully demonstrated its ability to withstand extremely strong acid water without undue deterioration.

The water end is constructed of materials suited to the kind of water that is to be handled. The pump can therefore be procured with plain cast-iron water end, with acid-resisting cylinder lining, piston and rod, valves and valve seats, or with a solid acid-resisting water end.

The base is constructed so that axles may be employed and truck wheels placed thereon, so that the pump may be easily moved from one place to another. It is believed by the manufacturers that every point has been considered in connection with this pump and that a machine has been produced of the greatest reliability at a comparatively small price.

An Acid-Proof Pump

By C. W. Crawford*

In the development of pumps used in mines the original plan was a vertical plunger or piston driven by a crank and gearing at the surface. In the plunger pumps, the plunger and pump-rods were designed to equal about one-half the weight of the column of water to equalize the power on both strokes, the plunger being arranged to work through a chamber or cup of oil on the stuffing-box whereby the lubrication was constant and directly applied. This was the best of all mine pumps when properly installed—then called lifting pumps.

Piston pumps were used more or less at the same time, 50 years and more ago. In the latter the cylinders were bored, but not always lined with brass, and the bucket plungers made of brass were fitted with cup leathers in a substantial way. But in those times, as now, the acid water played havoc with the cylinders. These were used in some of the extensive mines in Pennsylvania with very indifferent success.

Later on, during the Civil War, direct steam pumps came into use, and these, like the bucket plunger type, were at first made with plain iron cylinders, which gave trouble in acid water. Later pump-makers used liners of rolled brass fitted with butt joints. These soon wore out and made more trouble.

Plunger Pumps Have an Advantage When Worked Vertically

The steam pumps held the field when fairly introduced because of their convenience and portability, but it was soon found the cylinder liners had to be of more substantial material than sheet brass. The majority of the pumps to the present time have been piston pumps, but the plunger pumps have some advantage when worked vertically, as above stated. The valve seats of all pumps give as much trouble as the cylinders, while pump-rods and pistons fare very little better in strong acid water. The experiment of babbitt-covered rods has met with considerable success in the hands of careful engineers, but this cannot be considered permanent.

The principal terror of the coal-mining trade consists in the vicious acid water found in nearly all mines and its action on the pumps discharging it. The dullness of the coal trade is discouraging, but it is temporary, while the menace of the acid water is perpetual and everlasting whether the mine is working or idle. Plenty of pumps are to be had in the market, and all of them are efficient for the time being, but they are not built to resist acid water indefinitely; hence the duty of the pumpman is more or less onerous, and it frequently happens that pumps of the most reputable makers are eaten up past repairing in six months.

These are iron-body pumps with bronze cylinder liners, pistons, rods and valve seats, all parts of which are attacked by the acid, aggravated by the friction of packing and the wash of the water. Solid bronze water-ends are subject to the same wear and tear and frequently give out in a year. The ultimate fact in the pump proposition is that there are but few acid-proof pumps adapted to mining purposes.

The history of one such machine is a long story of partial success and partial failure in combating the enemy. The wearing parts of this particular pump are of a metallic composition that is as hard as tempered tool steel, and at the same time proof against all the ordinary acids contained in mine water; hence the wear is reduced to a minimum, and the life of the pump, barring accidents and abuse, is prolonged indefinitely. The preference is given to piston pumps for the present, but plunger pumps will be included later. As a necessary consequence the added material and labor will enhance the cost of these pumps somewhat, but the slight advance will be rebated in the reduced operating expense and the longer life of the pumps, every part of the interior of these pumps being practically invulnerable.

The acid-proof pumps designed for mines and referred to in the foregoing are built by Crawford & McCrimmon Co., Brazil, Ind. They may be driven by steam or electricity.

*President, Crawford & McCrimmon Co., Brazil, Ind.

A Monster Centrifugal Pump Installation

Modern engineering enterprises are, wherever possible, conducted on a gigantic scale; for it has been found here, as in business, that doing things by wholesale is cheaper than retail methods. A recent case illustrating this occurred in New Orleans, where very large quantities of water had to be handled in drainage work; and to meet the requirements four immense centrifugal pumps were ordered, which are said to be the largest of their kind in the world.

These big pumps have a delivery opening of 78 in. diameter, and are capable of delivering 168,000 gal. of water per minute at a 1-ft. head, which is equal to the

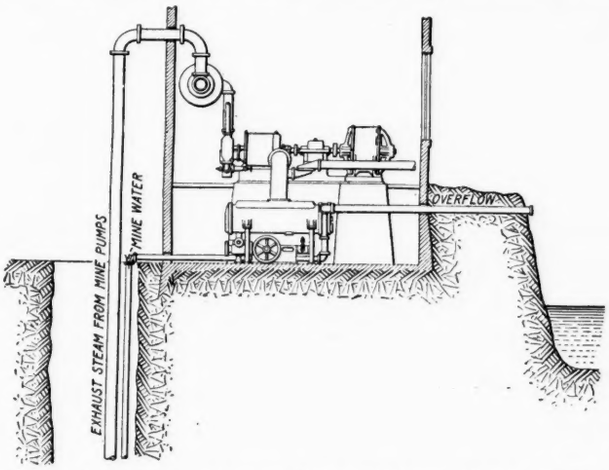
flow of a good-sized stream. The head of water will vary under different working conditions from 1 to 13 ft., and at this latter difference of level 90,000 gal. per min. can be handled; but the pumps are required to turn much faster than at low lifts, for whereas they do their work at 55 r.p.m. when the head is but 1 ft., it requires 113 r.p.m. to move the stated amount at the 13-ft. head. This, however, is by no means excessive, and the pumps will be economically operated by Nordberg-Corliss compound condensing engines.

Besides these monsters there is a fifth pump in the outfit which has an outlet of 48 in. and a capacity of 47,500 gal. per minute at a 3-ft. head, as against 156,000 gal. at the corresponding lift by its big brothers. These pumps are built by the Southwark Foundry & Machine Co., of Philadelphia.

Securing Power from the Exhaust of a Pump

At many coal mines direct-acting steam pumps are employed under ground to rid the workings of water. This water is raised to the surface and discharged into some nearby stream or watercourse. The steam after operating the pump is piped to the surface and allowed to escape into the atmosphere.

The accompanying illustration shows how some of the heat contained in the exhaust steam may be utilized for



CROSS-SECTION THROUGH POWER HOUSE USING PUMP EXHAUST

the generation of electric current. The steam as it comes from the mine pump is passed through an eliminator, and thence to a low-pressure turbine, which exhausts to a surface condenser. The water discharged from the mine pump is passed through this condenser on its way to the watercourse, and thus condenses the steam.

By this means a source of energy which goes to waste in considerable quantity around many coal mines is turned to a useful end. In the particular case which is illustrated herewith, approximately 200 kw. of power is secured from steam which hitherto had gone to waste. The only live steam required is that necessary to operate the condenser pump, which is shown placed under the condenser. There is of course an overhead charge owing to the investment in the necessary low-pressure turbine and generator, together with a slight amount of extra piping. The motive power, however, costs practically nothing.

Kentucky Mining Institute Meeting

The Kentucky Mining Institute will hold its fourth annual meeting at Pineville, Ky., on May 14 and 15. The tentative program is as follows: Friday morning, starting at 7 o'clock, trip to the mines in the vicinity of Pineville, going as far as Benham and returning by way of Coxton, Ky., where lunch will be served by K. U. Meguire, of the Harlan Coal Co., reaching Pineville at 4 p.m. Friday evening, at 7 o'clock sharp, the banquet will be held. Saturday morning at 8:30, business meeting and consideration of papers; Saturday afternoon at 2 o'clock, first-aid meet with prizes, amounting to over $400; Saturday night, consideration of papers.

COMING MEETINGS

International Railway Fuel Association will hold its annual meeting at Chicago, May 17-20. Secretary, C. G. Hall, 922 McCormick Bldg., Chicago, Ill.

Rocky Mountain Coal Mining Institute will hold its next meeting in Trinidad, Colo., June 8, 9 and 10. Secretary, F. W. Whiteside, Denver, Colo.

West Virginia Mining Institute will hold its summer meeting at Wheeling, W. Va., June 15 and 16. Secretary, E. N. Zern, Morgantown, W. Va.

The American Society of Mechanical Engineers will hold its summer meeting at Buffalo, N. Y., June 22-25, 1915. Secretary, Calvin W. Rice, 29 W. 39th St., New York City.

The Illinois Mining Institute will hold its next meeting at Danville, Ill., May 27-29, 1915. The officers of the Institute are: President, J. W. Starks, Georgetown, Ill.; first vice-president, William Burton, Herrin, Ill.; second vice-president, Fred C. Pfahler, Belleville, Ill.; secretary and treasurer, Martin Bolt, Springfield, Ill.

The Kentucky Mining Institute will hold its summer meeting at Pineville, Ky., May 14 and 15, 1915. Secretary-treasurer, Ivan P. Tashof, Lexington, Ky.

The American Institute of Electrical Engineers will hold its annual convention June 29 to July 2, 1915, inclusive, at Deer Park, Md. Headquarters will be at the Deer Park Hotel. Secretary, F. L. Hutchinson, New York.

The Coal Operators of West Virginia under the auspices of the Norfolk & Western operators, in conjunction with the U. S. Bureau of Mines and the Huntington Chamber of Commerce, will hold a state-wide first-aid and mine-rescue field meet and contest in Huntington, W. Va., May 14, 1915.

Recent Legal Decisions

Company's Liability for Malicious Prosecution—A coal company is liable in damages for malicious prosecution instituted against a person by its superintendent acting in the line of the corporation's business affairs. (West Virginia Supreme Court of Appeals, Lyons vs. Davy-Pocahontas Coal Co., 84 Southeastern Reporter 744.)

Validity of Ohio Anti-Screen Law—The Ohio law which provides that where miners' compensation is based upon tonnage of coal mined they must be paid according to the total of all coal contained in the mine car in which it has been removed from the mine, except that no greater percentage of dirt and impurities shall be contained therein than that ascertained to be unavoidable by the State Industrial Commission, whose orders are subject to review, and except that operators and miners may agree upon a docking system, is not invalid as violating the constitutional guaranty of freedom of contract, but is a valid exercise of the state's police power. (United States Supreme Court, Rail & River Coal Co. vs. Yaple, 35 Supreme Court Reporter 359.)

Equipment of Coal Cars—Under the laws of Alabama a coal operator is liable for injury to a miner resulting as a direct consequence of the operator's failure to equip cars with safety appliances to prevent their running away and down into a mine to the peril of miners. (Alabama Supreme Court, Setzer vs. Burnwell Coal Co., 67 Southern Reporter 604.)

Some Large Steam Pumps

The art of building direct-acting steam pumps for mine service might appear to the casual observer to be making but slow progress. The type of these machines now built and installed closely parallels, if not exactly duplicates, the units constructed 5 to 10 years ago.

The direct-acting duplex pump has always been the steam-driven machine most favored for use in draining American coal mines. This is probably due to the fact that the space available underground places a limit upon the dimensions of the subterranean pumping engine.

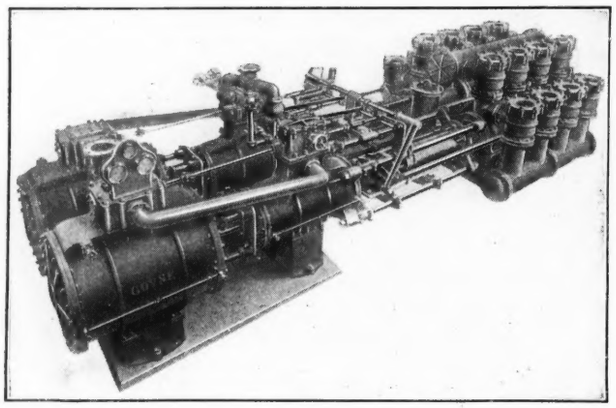


FIG. 1. GENERAL VIEW OF PUMP

This limit of height, length and breadth was for the majority of cases reached some years ago. Today if greater pumping capacity is required, it is in many cases, more economical to install several units than one extremely large pump.

The Goyne Steam Pump Co., of Ashland, Penn., is at present building two duplex direct-acting compound steam pumps of large size. One of these units is for the Mid-Valley Coal Co., and is an exact duplicate of a pump built some seven years ago and will be installed in a continuation of the original pump-room. The size of this machine is 23&39x14x48 in. The condenser employed will be a 12x18x18-in. single-cylinder machine of the spray type.

This pump differs from the other that will be installed in the Mary D. colliery only in the size of the steam end. This is due to a slight difference in the head against which the two machines will act and to the conditions of steam pressure.

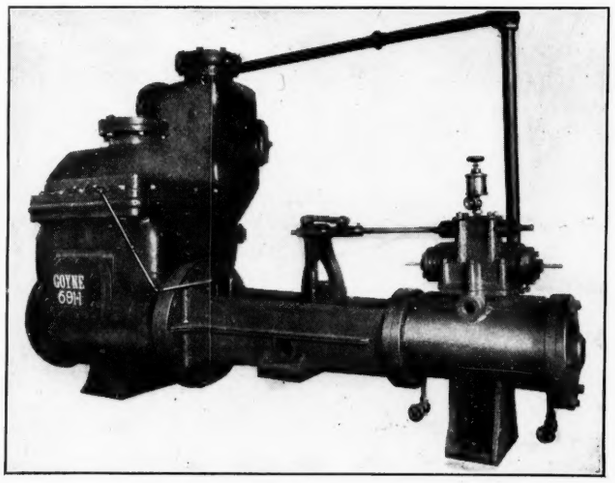


FIG. 3. THE CONDENSER EMPLOYED

The accompanying illustrations show the pump that will be installed in the Mary D. colliery and the condenser to which exhaust will be made. The size of the pump is 24&42x14x48 in. It will be located about 1200 ft. from the boiler-house and will handle 2500 gal. per min. against a vertical head of 620 ft.

The steam end of the pump is of Goyne standard compound type, the high-pressure cylinders equipped with the Goyne cutoff attachment, which effects a considerable saving of steam, while at the same time permitting the pump to operate at a higher piston speed than would otherwise be obtainable.

The water end of the pump, which is of the 16-valve-chamber type, is protected from the action of acidulous mine-water in its entirety. The entire water end is designed especially for wood lining, and all the castings, except the division plates between the working barrels, form true circles, into which are accurately fitted staves of seasoned white pine. The division plates are protected from the action of the water by having

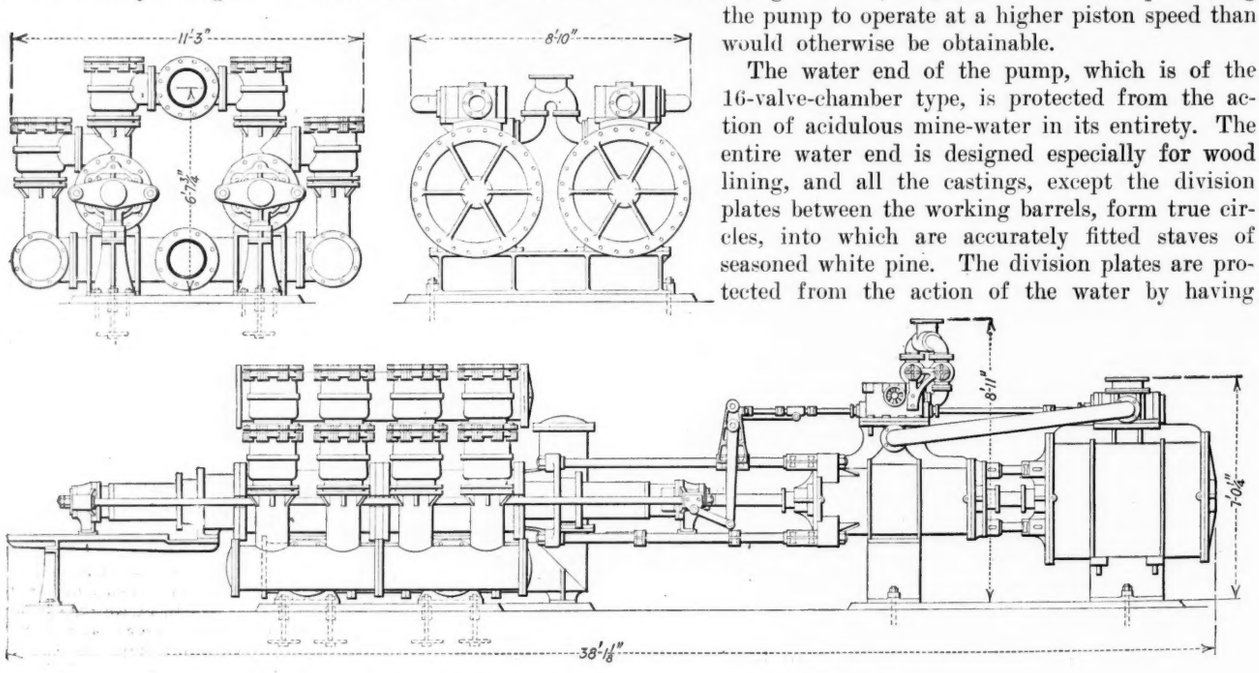


FIG. 2. SIDE AND END VIEWS OF THE PUMP

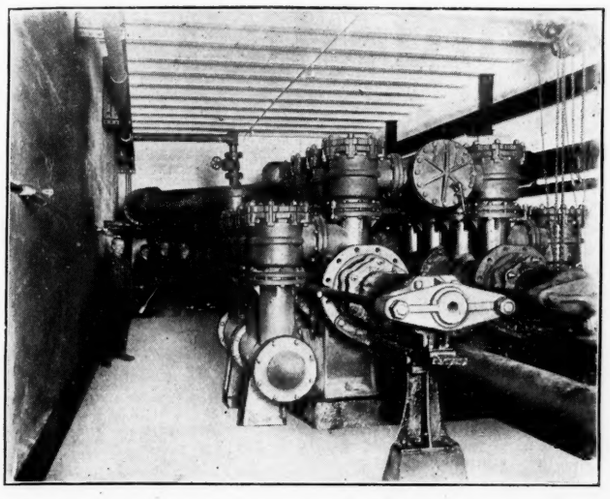


FIG. 4. PUMP INSTALLATION AT EXETER COLLIERY, 600 FT. UNDERGROUND

their faces covered with a special acid-resisting alloy. All packing-box throats are thoroughly protected by heavy machined bronze bushings which are tightly forced into place.

The condenser employed is of a heavy pattern spray type designed especially to cope with acidulous mine-water. It is full bronze fitted throughout. This condenser avoids the delicate mechanism sometimes found in machines for this purpose, and therefore reduces the upkeep to a minimum.

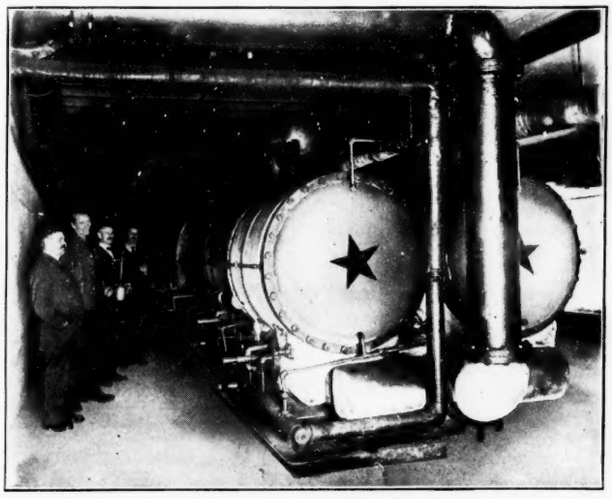


FIG. 5. ANOTHER VIEW OF THE GOYNE PUMP AT EXETER COLLIERY

March Anthracite Shipments

The shipment of anthracite during March was 4,985,398 tons as compared with 5,164,703 tons in March, 1914, a decrease of 219,305 tons, but the tonnage of the Lehigh & New England was not given by the Bureau of Anthracite Statistics. The amount of coal on hand at tidewater shipping ports increased 91,117 tons, from 782,581 tons on Feb. 28 to 873,698 tons on Mar. 31.

The Philadelphia & Reading led for the month with 961,415 tons, the Lehigh Valley was second with 894,031 tons and the Lackawanna was third with 644,932 tons. The Delaware & Hudson carried 617,605 tons, the Erie 593,250 tons, the Central of New Jersey 578,322 tons, the Pennsylvania 544,023 tons and the New York, Ontario & Western 151,820 tons.

Itinerary of Bureau of Mines Rescue Cars

CAR NO. 8

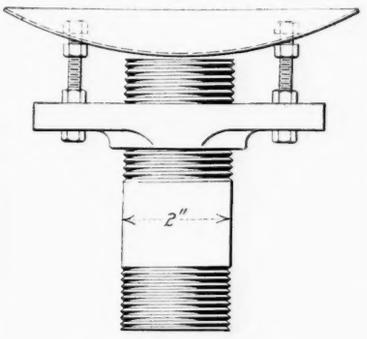
Glenalum, W. Va., Mar. 23 to Mar. 28.
Thacker, W. Va., Mar. 29 to Apr. 7.
Redjacket, W. Va., Apr. 8 to Apr. 18.
Williamson, W. Va., Apr. 19 to Apr. 29.
Chattaroy, W. Va., Apr. 30 to May 9.
Huntington, W. Va., May 10 to May 15.

CAR NO. 6

Yatesboro, Penn., Apr. 17 to May 1.
Soldier, Penn., May 1 to May 8.
Wishaw, Penn., May 8 to May 15.

New Sprinkler System for Coal Breakers

Sprinkler systems which can be turned on by hand from outside the building have been installed in 14 of the wooden anthracite-breakers of the Lehigh Valley Coal Co., Wilkes-Barre, Penn. Tests of these systems before a committee of the Underwriters' Association of Pennsylvania have resulted in a substantial reduction in the high rate of coal-breaker insurance now in force, for breakers thus equipped.



SPECIAL SPRAY-HEAD

The new sprinkler system consists of pipes spaced 10 or 15 ft. apart and equipped with nozzles pointing upward which dash water against convex or flat metal plates fastened to the feed pipes as shown. The water is thus diffused. About one hundred 2-in. nozzles are required to protect a large breaker. The nozzles are fed by 2-in. pipes, leading from various sizes of water mains.

The new system supplements, but does not replace, the regular fire-fighting apparatus installed in every breaker, such as hose, standpipes, fire-pails, sand-pails, water-barrels and hand-grenades. When the system is operated, the interior is filled with a steady downpour of water, similar to a heavy rainstorm. At such a time it is possible for men to enter the structure and attack the fire with the regular fire-fighting apparatus, the spray system being independent of the regular apparatus. Without such a system, it is almost impossible to enter a breaker which has caught fire; the conflagration is quick and hot, because of the numerous drafts throughout the immense structure.—From *Engineering News.*

The ring system of steam piping is a thing of the past and should never be used. It involves unnecessary expense, mechanical complications, increased losses through radiation, increased danger from water collection and water hammer and it does not afford the additional security to the supply which is supposed to justify its adoption.

The Labor Situation

SYNOPSIS—Workingmen at the Nesquehoning colliery claimed the right to quit work at 3 p.m. instead of at 4 p.m., the time specified by the Lehigh Coal & Navigation Co. The umpire denied the miners' contention. In the Walsh-Rockefeller controversy the former charges that the latter has misrepresented the relation in which he stood to the management of the Colorado Fuel & Iron Co. and declares that the letters of Governor Ammons were written by Rockefeller agents. In southeastern Ohio attempts at mediation continue.

George Gray, one of the umpires of the Anthracite Conciliation Board, has decided against certain classes of workmen employed in the Nesquehoning colliery of the Lehigh Coal & Navigation Co. They contended that they ought to be permitted to quit work at 3 p.m. instead of at 4 p.m. The decision of the umpire was that the agreement in 1909 fixed 4 p.m. as quitting time and the miners could not claim exemption from this provision.

"Miners" Are Men Who Work in a Mine

It was decided on Apr. 19 that the word "miner" in the state mining law was broad enough to cover all the 160 candidates for mine foremen and assistant mine foremen in Schuylkill County whose certification had been held up by process of injunction because the men had not actually shot coal for five years at the face.

The court says that all employees working in the mine may receive certificates if they are otherwise qualified. The mine workers are given three weeks in which to file an appeal to the Supreme Court from the decision of the Dauphin County Court. Until that time the injunction restraining the Department of Mines from granting the certificates is still in force.

The Manners and Morals of Committeemen

The United States Commission on Industrial Relations is about to resume sessions in Washington, D. C., and Frank P. Walsh, the chairman, is again telling the public in advance what he expects to prove.

When we remember that the President appointed a labor agitator and a man who might well be regarded as a neutral, Hywell Davies, to decide the rights and wrongs of the eastern Ohio situation and then held up the report for several weeks in order to help a final settlement, we are surprised at the contrast in this instance. Here the chairman of the commission, because he is the friend of a party in the controversy, instead of trying to conciliate matters, gives out his conclusions before the whole evidence is presented and in such a provocative manner that it is well calculated to prevent harmonious relations.

What Committeemen Should Not Do

Government commissions need to learn something from the courts. Their decisions should not be subject to presidential demurrers and certainly not to presidential correction, neither should they state their conclusions prior to the completion of the investigation on which their judgment is supposed to be based. Men like Senator Martine and F. J. Walsh, who have both conducted commissions as means of advancing political propaganda, should be brought sharply to task.

The pulpit in the church, the class-room of the Sunday School and the rostrums of Cooper Union and Carnegie Hall are places to be avoided by those whose work is judicial. They are no places in which to discuss conclusions before the inquiry is completed. The manners of government investigators need regulation. The action of Senator Martine should be a crime punishable by impeachment and that of Frank S. Walsh should be gently corrected by fine and imprisonment, wholly without regard to the truth or falsehood of their conclusions. It must be conceded, however, that the offenses of these commissioners have been against the ethics of their profession rather than against the law.

Walsh Says that Rockefeller Wrote Letters for Ammons

Mr. Walsh declares that John D. Rockefeller, Jr., actually directed the action of his subordinates throughout the Colorado strike and did not leave matters so unreservedly in their hands as he testified on the stand. He says John D. Rockefeller, Jr., "presumed to dictate letters that were sent out to the President of the United States and to the governors of the States over the signature of the Governor of Colorado."

The first categorical denial came from Governor Ammons. Rockefeller's final reply was more detailed and therefore appeared later, on Apr. 25. He stated that Governor Ammons sent Major E. J. Boughton, adjutant-general of Colorado, in May of last year to New York City. Mr. Rockefeller says in his letter:

> I never met Major Boughton, but he told Mr. Lee, of the Rockefeller office, that Governor Ammons had been much disturbed over the misunderstanding which prevailed in the Eastern States concerning many phases of the Colorado strike.
>
> Major Boughton asked Mr. Lee if he had in mind any effective way of getting the facts before the public, and he suggested that a letter be written by Governor Ammons to the President of the United States and to the governors of other states setting forth the situation as Governor Ammons saw it. Major Boughton stated that he could not tell how the Governor would regard such a suggestion and that even Major Boughton himself would have to convey the suggestion through General Chase, Major Boughton's superior officer. To get the matter into shape for consideration Major Boughton asked Mr. Lee to make his suggestion concrete by preparing a draft of the kind of letter which he had in mind. As a basis for the preparation of this draft Major Boughton sent Mr. Lee a memorandum of his own views of the situation.
>
> The memorandum written by me and referred to in one of my letters as having been sent by me to Mr. Lee was nothing more than a rough draft of a statement concerning the Colorado situation which I had drawn up in answer to statements which had appeared in the press, but which had never been used.
>
> This memorandum was incomplete and only suggestive. When I learned of Mr. Lee's suggestion to Major Boughton, it occurred to me that this memorandum contained material which Mr. Lee might find helpful in that connection. Mr. Lee drafted his ideas and sent them to Major Boughton, but they were never even submitted to General Chase, let alone to the Governor. From Governor Ammons' statement in the mining papers it is obvious that he never knew that such a suggestion had been made.

Rockefeller Did Not Plan to Buy Up Newspapers

Mr. Rockefeller denies that he at any time ventured to direct the action of his subordinates relative to the strike situation and says that the correspondence secured by the commission in response to the subpoena duces tecum proves only that he did not influence their action. He denies another charge that he had a plan to publish a string of daily papers. A man Mr. Rockefeller had never even heard of wrote to Mr. Lee suggesting such a course, and Mr. Rockefeller declares that the only excuse Mr. Walsh has for his charges is that Mr. Lee referred to this letter in his correspondence with Mr. Rockefeller.

Nor is it true that Mr. Rockefeller had a plan of financing the official organ of the National Chamber of Commerce. This publication is known as "The Nation's Business" and is distributed without charge to the members of the Chamber of Commerce of the United States. Mr. Rockefeller states that the president of that body applied to him for his support for the paper on various occasions, and though he thought the proposition legitimate he never acted favorably on it.

Another statement to the effect that Mr. Bowers praised Mr. Murphy for not giving information regarding the Colorado Fuel & Iron Co. to Ethelbert Stewart, the representative of the Department of Labor, is denied, and Mr. Rockefeller further denies that Mr. Stewart asked for any information whatever.

Mr. Walsh expects to call Mr. Rockefeller, Mother Jones and several other persons connected with the Colorado troubles. On Apr. 28 Mr. Walsh made a reply to Mr. Rockefeller which had but one effect—that of substantiating the force of Mr. Rockefeller's argument.

There May Soon Be Peace in Eastern Ohio

The principal event in the eastern Ohio strike situation during the past week was the effort of Governor Willis to bring about an agreement. He undertook the role of mediator and called a conference of miners and operators at Canton, Apr. 24. He spoke at length to both sides urging a settlement. While it was presumed that he had a plan, he frankly said he had none, although he believed that an adjustment could be reached. Governor Willis was accompanied by J. M. Roan, chief deputy of the Industrial Commission of Ohio and the safety commissioner of mines, who took a part in the meeting.

After the talk from the Governor each side met separately and named members of the joint scale committee. The operators' representatives consist of W. R. Woodford, H. E. Willard, C. E. Maurer, R. L. Wildermuth, Joseph Pursglove, S. H. Robbins and G. M. Jones. The miners' representatives are J. P. White, national president of the United Mine Workers of America; Lee Hall, Charles J. Albasin, Fritz Fraetz, Charles Fischer, Jerome Watson and William Somerville. After organ-

izing, the joint scale committee immediately adjourned to meet in Cleveland at 10 a.m., Apr. 27.

Dangers of Mining According to Methods Favored by Union

One of the features of the session at Cleveland was the attendance of the mine superintendents to discuss methods of safety in mining and the conservation of the coal supply. Mining with wide rooms and a road up the center as now practiced is not conducive either to the safety of the men or the conservation of the coal supply.

The meeting at Cleveland in the Hollenden Hotel really appears on going to press to be likely to result in an agreement. The miners' representatives still hold firm to the 47c. rate, to which they are irrevocably pledged. But they see that concessions must be made in every other direction, and it is rumored that they are willing to reduce allowances for rock handling and brushing to such an extent that the price of run-of-mine machine-mined coal at 42c., with the present allowances, would be practically equivalent to 47c. with those allowances modified as suggested.

C. E. Maurer, of the Glen's Run Coal Co., the chairman of the preliminary conference of operators, mine superintendents and bosses, is said to have remarked, "I believe this is the first time the miners have met us with the definite idea of making a contract."

Baird Halberstadt's Anniversary Party

On Saturday, Apr. 24, Capt. Baird Halberstadt, geologist and coal-mining man of Pottsville, Penn., invited a number of his friends to join him in a little celebration, marking one-third of a century's service in the field of geology and mining. The whole affair was unique in its character and brought together a notable assemblage of American scientists. Admiral Robert E. Peary was

CAPTAIN BAIRD HALBERSTADT

the guest of honor, while geologists and coal-mining men from far and near made up the remainder of the party.

Captain Halberstadt has long desired to show his coworkers in the field of geology the wonders of the coal formations in the southern anthracite field, and he selected this anniversary occasion as a suitable time for such a reunion. Mr. Halberstadt's guests arrived in Pottsville Friday evening, at which time where was an informal reception at the Pottsville Club. Early Saturday morning the entire party left Pottsville in automobiles, which carried them through the various nearby coal-mining towns. Special attention was paid to the large stripping operations of the Philadelphia & Reading Coal & Iron Co. It was in these open-cut pits that the visiting geologists had their best opportunity to study the peculiarities of the coal measures.

W. J. Richards, president of the Philadelphia & Reading Coal & Iron Co. and a close friend of Captain Halberstadt, arranged a most interesting and instructive mining program for the visitors. During the morning, after inspecting the Bear Run stripping of the Reading company, the party was entertained by the Reading rescue corps, which gave a demonstration of first-aid and rescue work. Draeger apparatus was used. The Reading company was one of the pioneers in this kind of work in the United States, and the thoroughness with which their first-aid men do their work indicates plainly the long and careful instruction they have received.

Shortly after this the party arrived at the Maple Hill colliery, where a luncheon was served. Many of the visitors went down into the Maple Hill mine and were shown the methods of practical anthracite mining. In the afternoon, on the return trip to Pottsville, the Pine Knot colliery was visited, and the party was shown one of the newest and most modern power and hoisting plants in the anthracite field. It was especially noted by all that Mr. Richards' mines are models of order.

Saturday evening, again at the Pottsville Club, Captain Halberstadt entertained all his friends at a dinner commencing at 9 o'clock. The party was a merry one, and the after-dinner speeches were given in a vein of humor that kept the assemblage greatly amused until past the midnight hour. There were no dull moments for anyone, and few men were ever so highly honored, or so sincerely appreciated for their real worth as was Baird Halberstadt on Saturday evening. Captain Halberstadt has worked with industry and intelligence and to prove it the following met to pay their respects:

Rear Admiral Robert E. Peary, George Otis Smith, Marius R. Campbell, Prof. Frank Knowlton, Prof. George H. Ashley, Dr. Alfred H. Brooks, Dr. W. C. Mendenhall, Frank Sutton, Edward W. Parker, Charles Enzian, Prof. Henry Kummel, Prof. Thomas L. Watson, Dr. I. C. White, Dr. Edward B. Mathews, Prof. Frank De Wolf, Prof. H. A. Buehler, Prof. W. O. Hotchkiss, Prof. R. C. Allen, Dr. H. L. Fairchild, Dr. Gilbert Van Ingen, Dr. Charles E. Munroe, Prof. George W. Littlehales, Dr. W. R. Crane, Dr. Frederick B. Peck, Prof. Andrew S. McCreath, Prof. Bailey Willis, Capt. A. F. Lucas, Frank L. Hess, Floyd W. Parsons, Frederick W. Saward, W. J. Richards, S. D. Warriner, Edwin Ludlow, W. C. Whildin, Thomas Fisher, Morris Williams, Robert A. Quin, Frank A. Hill, John J. Tierney, E. A. Delaney, George M. Keiser, James B. Neale, William Auman, D. V. Randall, W. Corde Snyder, W. R. Reinhardt, Reese Tasker, George S. Clemens, Claude F. Lewis, William P. Smythe, Joseph H. Garner, John F. Bevan, E. E. Kaercher, George B. Hadesty, John H. Pollard, James McDonald, J. P. Jones, John Wood, Francis Critz, A. G. Blakeley, W. H. Lesser, J. P. Jennings, James Morris, J. E. Turk, R. H. Buchannon, A. E. Lehman, Edwin M. Chance, Horatio Morris, Edwin C. Luther, Arthur W. Shaefer, William A. Cochran, William S. Pugh, Charles W. Wagner, Edward Brennan, Hon. James E. Roderick, M. J. Brennan, John Curran, Herbert Kynor, William Wells, Hon. MacHenry Wilhelm, Hon. R. H. Koch, Hon. Charles N. Brumm, William S. Leib, William B. Rockwell, E. L. Herndon, Robert Allison, W. H. Stout, William H. Lewis, Harry Hunter, Col. James Archbald, Hon. F. Pierce Mortimer, Hugh Dolan, Hon. A. L. Shay, J. S. Ulmer, C. T. Brown, J. W. Fox, B. J. Smith, C. T. Mould, Dr. J. B. Rogers, Dr. L. T. Kennedy, Dr. W. C. Bowers, C. W. Unger, Dr. H. J. Herbein, James R. Williams, Frank Muehlhof, Capt. C. M. Wilhelm, Capt. S. B. Edwards, J. J. McKnight, Rev. Dr. James F. Powers, D. W. Kaercher, George M. Roads, Dr. G. H. Halberstadt, G. A. Muehlhof, Dr. A. L. Gillars, Hon. James B. Reilly, W. G. Gregory, B. S. Simonds, H. I. Silliman, A. H. Roehrig, R. C. Shearer, A. H. Tiley, George H. Steidel, Hon. C. A. Snyder, Capt. Harry Chambers, Hon. R. D. Heaton, Daniel Duffy, T. B. Van Buren, George D. Evans.

Editorials

Men and Americans Only

Some time ago the industries were run "for revenue only." In fact, if you read the incorporation articles of our companies you will see that any other purpose is wholly alien to the ends of corporations. Positively unlawful, however beneficial, are many of the modern developments. But these deviations from the strict letter of the law, these sundry engraftings of soul into organizations framed only to obey the letter of the law and to make a profit, are excused by the public, by a sort of general consent.

Not a single bold spirit has risen in the courts to test the right of the corporation to become in all respects like a man and contribute to almost anything—except of course a political party or a selling agency. And every one is pleased that the corporation has been permitted to assert its place in the sun of genial friendship and fellowship.

But so far most of the generosity exhibited by these fictitious individuals—corporations—has been confined to men and Americans only. The employees have been considered to the exclusion of the women and children dependent on them, and non-English speaking men have been too often forgotten. But this is being rectified rapidly. The schools are being bettered; the villages are cleaned; the milk is made pure; domestic science is taught, and sewing circles are established. Safety work is not now the sole end of sociological work, though it had its beginning in it.

In its sociological work the Colorado Fuel & Iron Co. has advanced far beyond the rule of "men and Americans only" and is seeking the welfare of the women and children and of the aliens as well as those who speak English. At its meet in Trinidad it expects to have a *boccia* contest for the Italians. The directors have noted that these foreigners are not playing baseball or basket-ball, but are amusing themselves with *boccia* (pronounced we believe boh-chee-ah), and so in order to enlist their interest in this absorbing game of bowls on an earthen alley it is to be made the basis for several eliminations and for a final contest at Trinidad, Colo.

The boys and girls will have their fun competing for the basket-ball award. A 100-yd. race for boys under 16, a 50-yd. dash for girls of the same age, an egg race for girls under 12, a three-legged race for boys of equal immaturity, a nail-driving contest for women and a drill for the Boy Scouts will remove the partiality with which in so many coal villages the inhabitants have been treated.

The tendency is to make welfare work general and not to take up only those parts of it which are easily performed—the work among English-speaking people for instance. The Ellsworth Collieries Co. is making earnest efforts to assist the Russians, Italians and Slavs in forming glee clubs and bands, the men arraying themselves in their native costumes. The H. C. Frick Coke Co. is showing a similar interest in these musical developments, and in the parades at Gary the foreign beneficial societies are also represented.

The narrow-minded native sees in the formation of racial societies a source of danger. They do not so appear to us, because it is always found that to avoid antagonizing any man's national, as also his religious, animosities is the surest way to make him a good citizen. The game of *boccia,* for instance, will be played whether frowned on or encouraged. If welcomed it will form a link between the Italians and their American friends. If it is merely regarded as a queer game of an alien people, the Italians will be confirmed in their exclusion from Americans for they will still continue to play it among themselves.

Seeing that corporations are permitted to spend their funds to advance the interests of their employees, the broadening of the movement to include all the workmen and every member of their families is an extremely welcome feature in recent developments. For the foreigners and the women altogether too little has been done in the past.

Why the Roof Is Usually Weak under Valleys

Dr. White, in his recently published remarks on the paper of the late lamented Frederick C. Keighley at the last meeting of the West Virginia Coal Mining Institute, stated that there is no apparent geologic reason why the roof under valleys should be less reliable than that under the hills. He added with perfect frankness, however, a comment which we might well paraphrase into the statement that facts frequently show a disturbing indifference to the arguments of the geologists.

Later, he declared that the removal of cover might have caused the percolation of water and the consequent decrease in strength. Frank Haas urged that the measures in Scotland which were mined under the sea with not over 100 ft. of cover were found to be in good condition. Consequently he did not believe that water affected the condition of the measures under valleys.

It is probable, however, that where the water is from the sea it does not have an equally solvent effect with that derived from rain or impregnated with the acids from vegetation, being already saturated with solutions and devoid of one of the best lime solvents—carbon dioxide. In many cases carbonate of lime is being deposited, and in such waters we may be sure it is not being dissolved. Furthermore, deep-sea water carries but little entrained oxygen to affect the rock binders.

Another important matter is the level of the water table. When the water rises and falls in the measures, the effect is much more severe than if it continues at any given level. In fact, total submergence is helpful rather than detrimental as one can note in mines that have been flooded with water for some 30 or 40 years. Both timber and rock are unfavorably affected by frequent changes in their water content. Dryness and

immersion are neither so severe in their action as alternation and variation of those states.

There is another cause perhaps more important than those just mentioned, and that is the fact that most valleys tend to become the *loci* of small anticlinals. The overbalancing weight of the hills on soft or softened strata thickens the coal and heaves up the clays, shales and even the sandstone.

The valleys thus are subjected to creep, and it is generally found that on opening coal on the side of a valley it dips into the hill from the level at which it is first found as a fully developed bed. The wash, of course, may be seen well below the bed level, but as the hill is entered and the coal is found of the full normal thickness or even thicker it is seen to dip toward the heart of the hill. The thickness also appears to be greater at the crop for like reasons.

There is no question but geological readjustments are always taking place. The hills are settling and the floor of the valleys tilting up. The weight of a hill 200 ft. high is 16 tons per sq.ft. This is twice as much as it is permissible to put on dry clay, nearly three times as much as moderately dry clay should have to sustain and from 8 to 16 times as much as should be loaded onto soft clay. No one would think of up-ending the Washington Monument on a bed of the last-mentioned material without preparing first of all a broad base on which to rest it. So apparent is this that an architectural structure without an adequate base is considered a monstrosity. The eye instinctively condemns it as a freak and the aesthetic sense is offended accordingly.

We must never pass over the fact that the hills are in a condition of unstable equilibrium. Where shelving shores approach the coast, the floor of the sea may not be broken as in the instance of which Mr. Haas aptly reminds us. Where the measures are solid limestone and have not been weakened by percolation, they may stand the strain, as is the testimony of C. E. Krebs in relation to the coal at Steubenville under 90 feet of such cover. But where the measures are weak and subject to creep, nature will enact one of her silent revolutions by which hills and valleys tend to become level and are only prevented from fluxing, in approximation to a perfect plain, by the continued action of the eroding water. Even where the measures in valleys are strong in compression they may yet fail in tension when the clays below heave under them and thrust them upward.

Nature and nature's laws are therefore hardly in conflict. About 10 years ago the facts here suggested were the occasion of extended comment in the technical press, and there seems little reason to doubt that they explain why the roof under the valleys is more treacherous than that under the burden of the hill.

Boiler Compounds in Coal-Mine Power Plants

The primary business of a coal-mine superintendent is to mine coal. He must do this in the cheapest and most economical manner consistent with safety and the natural life of the mine. The operation and upkeep of the mechanical equipment necessary for the attainment of this end are of necessity a side issue, regarded by many superintendents as an unwelcome duty and a necessary evil.

If the feed-water employed in the boiler plant is drawn from a surface supply, as is frequently the case, it is not only apt to contain various scale-forming materials in suspension or solution, but humic acids formed by the decomposition of animal or vegetable matter. Also, if the supply comes from streams into which mine drainage is introduced free sulphuric acid in more or less quantity is almost certain to be encountered. Water from deep wells which might be regarded as of most excellent quality for household or drinking purposes is apt to contain a considerable percentage of carbonate or sulphate of lime or magnesia, the scale-forming qualities of which are well known to power-plant men. In short, the coal-mine boiler plant is subject to practically all the troubles and disorders due to feed-water which beset industrial steam plants, with a few others not ordinarily encountered elsewhere thrown in for good measure.

And possibly because of the fact that a mine manager is a man wise in the ways of mines and miners, but not versed in those of acids and the scale-forming ingredients of boiler-feed waters, the coal-mining field has always been one of the best places for the operations of the boiler-compound salesman.

Certain boiler compounds have their legitimate fields, and there exist many reputable firms regularly vending chemicals or chemical mixtures to be introduced into steam boilers for the purpose of neutralizing acids or decreasing the baleful effect of the scale-forming materials carried by the boiler-feed water. But no boiler compound in the usually accepted sense of the term was ever invented, evolved or discovered that proved in every-day use to be the panacea that many smooth-tongued and unscrupulous salesmen would lead us to believe.

In the majority of cases the boiler compounds offered for sale contain a soda-ash base with often tannic ingredients added. While the employment of such compounds may not cause trouble unless the boiler is given an overdose (in which case severe priming, or blistering, and burning of tubes may ensue), the results obtained are seldom, if ever, commensurate with those secured by treating the bad feed-water before it enters the boiler.

There are two facts which it is well to keep carefully in mind whenever a compound salesman unlimbers his artillery and expatiates volubly on the virtues of his particular brand of boiler cure-all: First, a steam boiler is a closed vessel in which it was intended that physical and not chemical changes should take place. Second, the treatment of a boiler-feed water by any chemical, either inside or outside the boiler, is a chemical process and should be under the supervision of a competent chemist. In other words, chemicals are introduced into a boiler-feed water solely for the purpose of acting upon other chemicals contained therein. Should a quantity greater than the amount necessary for this purpose be introduced the effect on the boiler and steam plant generally may be as disastrous as that resulting from the original impurities in the water. If it is impossible or impracticable to treat the water before it enters the boiler, a compound should be prepared especially for that particular water, the various ingredients and their amount being determined only after a careful analysis. Where the quality of the feed-water changes, as is frequently the case with a surface supply, the ingredients or amount of the compound employed should be varied from week to week to suit the changing conditions.

Sociological Department

Colorado Fuel & Iron Co.'s Contests

The Colorado Fuel & Iron Co. will hold a field day at Central Park, Trinidad, Las Animas County, Colo., on Aug. 14, at which members of the Fuel Department, the Colorado Supply Co. and the Colorado & Wyoming Ry. Co. in Huerfano and Las Animas Counties will be eligible to compete.

The camp doctor will certify on July 1 the names of all employees who have completed the training and who are eligible, in his judgment, to receive a first-aid certificate. The two camps in each county having the greatest number of proficient men thus certified will furnish a team for the contest. Employees already having certificates must present them to the doctor of the camp at which they are working not later than July 1, and the certificates must receive the doctor's indorsement.

The judges will be chosen from the medical staff of the Colorado Fuel & Iron Co. As said, there are two competing teams from each county, or four teams in all. The prize will be a banner for the successful team and a watch charm suitably inscribed for each member of the corps.

Baseball, Boccia and Basket-Ball

Las Animas and Huerfano County mines will hold elimination contests to select the best baseball team in each county, and these teams will contest for the prize on the field day, the award being 12 baseball uniforms with the name of the camp on the shirt. The Italians will be represented by two teams of boccia players, one from each county. A team consists of two men and the winners will receive $5 apiece.

A basket-ball contest will be held, open to the brothers, sisters, sons or daughters of employees only, the contestants being from 12 to 16 years old. The girls representing Huerfano County will line up against those of Las Animas County, and the boys from those two counties will be similarly pitted against one another. There will be a basket-ball and a pennant for each winning team. The elimination contest will be supervised by the school principals in each county, and the umpire and referee will be chosen from among the school teachers on the day of the contest.

Races, Nail Driving, Coal Shoveling and a Drill

There will be a 100-yd. footrace for men and boys over 16 years of age, another for boys under 16, and a 50-yd. dash for girls of the same age. There will be an entry from each camp in each of these races, and only the sons, daughters, sisters or brothers of employees or employees themselves may participate.

There is also an egg race for girls under 12, a fat men's race for those who weigh over 220 lb. and a three-legged race for boys under 12 years of age. The ladies will pound their fingers in a nail-driving contest, with a kitchen cabinet, a set of dishes and a washing machine as a reward for the three best wielders of the hammer. Each candidate for honors will have to drive 10 tenpenny nails with an ordinary carpenter's hammer. For this fearsome event it is announced that "first-aid teams will be in attendance."

A coal-shoveling contest in which a ton of nut or slack will be shoveled from one bin to another will be open to one representative from each camp. The Boy Scouts will drill, their efficiency being judged by a military man, and the best drill team will receive a 16x20-ft. tent and a United States flag.

A Nanaimo, B. C., Rescue Team

The accompanying illustration shows the team for mine rescue and first aid at the East Wellington Mine No. 1, of the Vancouver-Nanaimo Coal Mining Co. All the men but two have government certificates of competency. The teams meet periodically for practice in order to maintain a high standard of efficiency.

The Vancouver-Nanaimo Coal Mining Co. Mine-Rescue and First-Aid Teams 1914

Those in rear from left to right are: R. Hamilton, miner; J. Dixon, underground superintendent; C. Dikenson, miner. The men standing in a line in front of these from left to right are: J. Stewart, trainer; J. Knowles, fireboss; W. Williams, fireboss; J. McArthur, miner; R. Reid, fireboss; H. N. Freeman, manager; G. Grey, miner; G. Carson, miner; H. Hemer, master mechanic, and A. Jardine, miner. Crouching from left to right are: J. Hamilton, fireboss; J. Barton, miner; W. E. Tipton, miner; A. McNeil, fireboss, and W. Moore, overman. The patient is J. Diamond.

Operators Cannot Sell Sites for Homes

The oft-repeated charge that miners in West Virginia and other states are not home owners because the operators do not permit it has been well answered by a student of the conditions in West Virginia. He shows that in most cases the operators could not sell homes to the miners, no matter how much they might so desire. He also explains that it would be unwise for a miner to buy a home in a mining camp, even if the company were free to sell it to him.

In the first place there are but few tracts of coal land in West Virginia that are owned in fee simple by the mining companies. Nearly all real property is leased for the purpose of getting out the coal, and the corporations have no right to sell it to miners or anybody else—and they do not. But not having the right to sell, the operating companies do the best they can under the circumstances. They rent homes, and an investigation will show the house rent costs less in mining villages than anywhere else in the country.

Then again, suppose the operator could sell the miner land on which to build a house, would it be a good thing for the workman? In the mining villages there is no occupation not connected with mining, and everybody except the postmaster and the station agent works for the operating company. There is no other employer. Suppose a miner owns the place where he lives in this village, and he loses his job. How is he going to live? He will have to go elsewhere for employment, and if he cannot sell his home he must abandon it. Furthermore, if a man is not engaged in mining or some occupation connected with it he will not want to live at the mines, and as he grows old he wants a home where he can till the land around his cottage and where he is away from the scene of his years of toil.

Teach at the Y. M. C. A. both Night and Day

In spite of all that the state and the anthracite coal operators are doing to educate the 175,000 anthracite mine workers in Pennsylvania, the Wilkes-Barre Young Men's Christian Association is conducting also regular classes night and day for their benefit. The students who are on a night shift sleep until about noon and come to the school fresher than those who have worked all day and come to the school in the evenings. There are at present 94 men enrolled in the mining school of the Wilkes-Barre Y. M. C. A., and the average attendance is 60. The total enrollment in all the classes conducted by the association is 320.

The mining school has a three-year course, and there is a preparatory year for those who have no education and must begin at the bottom. During the first year of the mining school, instruction is given in arithmetic, mine gases, ventilation and mine law. The second year advances the students further in arithmetic and mine ventilation, and teaches mine surveying and more mine law. In the third year advanced mathematics are taught, mine surveying, ventilation, electricity and magnetism, mechanics and air compression and the course in mine law is completed. There are lectures on mining subjects throughout the course.

"You can always tell how the school is coming on by the look of the mines," said a mine foreman in charge of one of the classes. "When all is going well and the men are interested you find problems figured out in chalk on the sides of the mine cars and all over the doors directing the air currents below ground. Most of our men come from the Lehigh Valley, the Lehigh & Wilkes Barre and the Kingston Coal Co. Out of this class of twenty men only seven went to school after they were ten and only four after they were twelve, but some of them would stump you now in mathematics."

The mine school is conducted two days in the week, on Tuesdays and Fridays. In addition to the mining courses there are elementary classes for employed boys, a men's English class, and classes in arithmetic, algebra, geometry, grammar, spelling, penmanship, architectural drawing, mechanical drawing, elementary and advanced English for foreigners, for mail clerks and carriers, and in salesmanship and public speaking. The association has been successful in preparing a number of candidates for the Civil Service examinations.

Red Films for Danger

The New Jersey Zinc Co., Franklin Furnace, N. J., has had several moving pictures made of operations in their mines with a view to promoting safety. In this they have collaborated with the United States Bureau of Mines. The films are extremely clear and the information they impart most valuable.

They were presented on Apr. 7 before the New York Section of the American Institute of Mining Engineers at the Machinery Club, 50 Church St., New York City. One feature which received much favorable comment was the reddening of all parts of films which illustrated danger.

Thus when a drunken man comes forward to get his check at the office before going down the slope, the film illustrating the act is reddened to show to the non-English speaking foreigner the dangers of drunkenness. When a man tries to crowd into the man-skip after it has been filled to its complement, a red blush over the film visually condemns the action. When timbers are piled without crosspieces the films blush red again. The same is true when timbers are placed with nails standing up and the man who has been placing a double-set drops down on one of the upstanding points.

Coal Company Plants Fruit Trees and Truck Gardens

The Stearns Coal & Lumber Co., of Whitley County, Kentucky, is planting an orchard and will continue to set out trees until 4000 have been planted; 1000 to be apple trees, with fillers of 2400 peach trees, 200 each of pear and cherry trees and 100 plum trees. A large vineyard and an extensive area of bush fruits will be planted, J. E. Butler, general manager of the mining company, having provided a plot of 25 acres for the purpose.

G. D. Smith, of Richmond, Ky., was indirectly the originator of the movement, Mr. Butler being present at one of the farmers' institute meetings when Mr. Smith made a talk on the possibility of fruit-growing in the mountains. He has assisted Mr. Butler in his plans and has coached C. W. Broyles, of Pine Knot, on his own fruit farm near Richmond, so that the latter has been qualified for the work of preparing the ground and directing the planting and care of the trees.

The spaces between the rows will be used for a time in growing vegetables, and those which cannot be sold in the company's commissaries will be canned in a factory now to be built and equipped. There are numerous small orchards in the 70,000 acres held by the company, and Mr. Broyles will develop them.

Discussion By Readers

The Air Chamber of a Pump

In all that has been written concerning the pump and its action and the frequent mention made of the purpose of the air chamber of the pump, for maintaining a constant flow of water in the discharge or column pipe, I have never seen any mention of a point that frequently gives considerable trouble in pumping practice. I refer to what may be called the "waterlogging" of the air chamber of a pump.

As early as 1859 Joseph French, then superintendent of the Pittsburgh water-works, made the discovery that when a pump was operated under a high pressure the air in the air chamber became gradually depleted. The pump at the water-works of which Mr. French took charge had always worked badly, having a chronic pound or jar that could be felt by the tremor of the streets and buildings a block away. The plunger of the pump was 20 in. in diameter and had a 12-ft. stroke. The trouble was one of long duration. For years it had been a source of annoyance, and no one could offer a solution of the difficulty. Engineers East and West had been consulted without result.

Upon close investigation Mr. French found that the air chamber of the pump contained little or no air. This chamber was very large. He immediately set to work and installed a device to supply sufficient air to keep the chamber fully charged at the working pressure, with the result that the trouble was completely overcome. The pounding ceased and the pressure-gage indicated a steady, even pressure.

The lesson taught by this experience is that the air in the air chamber of a pump working under high pressure is more rapidly absorbed and carried away in the discharge of the pump when operating under a high than under a low pressure. The expedient adopted by Mr. French has since been followed by numerous other engineers; but few, if any, pump manufacturers pay any attention to the matter. The device consisted of putting a simple air valve in the suction pipe of the pump, which admitted sufficient air to replace that withdrawn from the air chamber by the discharge.

It has been generally supposed that the air contained in the water drawn into the pump would find its way into the air chamber and be sufficient to prevent the exhaustion of the air from that chamber that would otherwise occur. Experience, however, has shown this to be a false hope, and some means must be provided to replenish the supply of air in the air chamber, under the conditions named.

It required but a small air vent in the suction pipe to supply this need; but, strange to say, it was considered a crime in the installation of a pump to permit even the slightest leak of air into the suction pipe. Too much air admitted into the suction will certainly reduce the capacity of the pump, and it is necessary to carefully guard against this result.

A somewhat amusing incident is narrated of a Spanish engineer who, in 1766, attempted to raise water 50 ft. by means of a suction lift. The attempt naturally failed, and the engineer getting mad threw his hatchet with great force against the suction pipe. The hole cut in the pipe by the sharp hatchet admitted air to the suction, with the result that the pump caught the water and started working. The fact in this case was that the suction column was thus converted into an air lift, enough air entering the pipe to render the water column sufficiently buoyant for the atmospheric pressure to overcome the 50-ft. head. This experience has been since confirmed in numerous instances, where water has been raised by suction to a greater height than the theoretical 34 ft. at sea level. There is no advantage, however, claimed for the expedient in general pumping practice.

C. W. CRAWFORD, President,
Crawford & McCrimmon Co.

Brazil, Ind.

Directors' Visits

I can indorse what was said by Mr. Liddell, in reference to the visits of certain directors to the plants in their charge, in COAL AGE, Apr. 3, p. 612. It reminds me of some incidents that occurred on a similar visit of directors and officials to a mine, in my own experience. The results of that visit suggested to me the necessity of posting signs in various places on such occasions, "Hands Off." To make my meaning clear, I will recount briefly two or three of these incidents:

1. A few company officials recently going through the weigh-office at the noon hour discovered, as they thought, that the scales were out of balance and proceeded to remedy the supposed difficulty. The change made by the officials, however, caused considerable annoyance to the weighmaster, who found on his return that the cars were weighing heavy. On investigation he found that the average weight of empty mine cars agreed upon by the company and the union was balanced off by someone who had been meddling with the scales. He at once corrected the mistake.

2. The same noon hour one of the officials pocketed the weighsheet of the day before and carried it to the office, without the knowledge of the weighmaster, who had the habit of retaining the sheet for the previous day for checking purposes. He was compelled to borrow the checkweighman's sheet, of which he made a copy, which would have been unnecessary had the said official attended to what was his own business.

3. Inside the mine, a "brakie" in trying to avoid a runaway trip had set the brakes before starting. An official who happened to be in the mine that day and was behind the "brakie," with the best of intentions, began jerking the brakes out of the holders. Those who know how a loose brake will wabble back and forth will appreciate the trouble the "brakie" had in catching and setting the brakes again and will also know that he stood a good chance to be injured in so doing. Later he proceeded to tell the official a few things, and the burden of his remarks was "Hands off."

There is work for directors, as well as for weighmasters, "brakies" and many others about the mine. From trapperboy to president, all have their work to perform. The director cannot trap and the trapper cannot direct. When one man butts in on another man's job, it's a case of a square peg in a round hole.

Moral: Attend strictly to your own duties and do not attempt to do the work in charge of another man, until his failure to perform his part compromises your own responsibilities.

Co-operation in Coal Industry

Fearing that the editorial that appeared in COAL AGE, Mar. 27, p. 547, entitled "A Lesson from Germany," may create the impression that it is the aim of the coal operators of this section to unduly inflate prices, I desire to add a few words by way of comparing our conditions in this country with those that gave rise to the formation of the Westphalian Syndicate.

Though a German by birth, I think I can say without prejudice that the German method of selling coal was far better than any existing in either England, Belgium or France, although the Belgian and French selling methods are patterned closely after the Westphalian Syndicate.

This statement is true, notwithstanding the fact that France has a very stringent antitrust law. But in some 20 years of operation by the French Coal-Owners' Association, no attacks have been made by the government, the French officials having reached the conclusion that while the methods of the syndicate were technically a violation of the law, they were actually a benefit to the community as a whole. If I recall correctly, one suit was brought against a syndicate owning the iron mines, but the case was never brought to trial.

I believe the establishment of a trade commission will ultimately solve our difficulties, and I hope this will come before the situation becomes too bad and that it will result in recommendations beneficial to the country's industries. I believe our people as a whole are gradually getting over the hysteria that has existed against the so-called trusts and that this sentiment includes every businessman and employer. I think I have been consistent when I argued for publicity and for coöperation on the part of business-men with legislators. The press can help us greatly by urging that more business-men and fewer lawyers be sent to our legislative halls, also by urging that the actual solution of problems is the duty of legislators rather than making attacks on corporations and businessmen. Legislators should realize that labor-men cannot get anything unless they get it from their employers and that employers are entitled to reasonable returns on their investments.

It is true that some corporations have taken undue advantage of their positions and have indulged in unfair treatment of their employees or their customers; but this fact alone should not condemn every business and every corporation or every official of such industries. The opinion that every employer or official of the company is dishonest and would steal from his workmen for the benefit of his company is too absurd to deserve notice, and yet this opinion prevails in the minds of many.

Our people as a whole are too ready to charge conditions to the most convenient cause, and since the people here are the government, the prevailing condition seriously interferes with true progress. I do not believe that government supervision has ever or will ever be resented, provided it is handled on proper lines. Unfortunately too many investigators are prosecutors more than impartial representatives. This statement I make from personal observation. Government officials in any capacity should not take sides with the popular phase of a question, but should study carefully the economic aspect of industrial problems.

Government supervision in Germany is very rigid, because taxes are based on the earnings of coal companies—the higher the returns the greater the income to the government. This seems a popular method in other lines of business; why should it not be well adapted to the coal business?

What coal operators generally aim for (and this is not confined to the present efforts of some Indiana and Illinois coal operators) is permission to do business on the most businesslike basis. The efforts of the individual cannot succeed as well as the efforts of combination. Individual selling means individual advertising, which is further limited by insufficient returns. Collective methods seem to solve many problems. If labor is permitted to bargain for its product on a collective scale, why should not the employers of labor have the same permission in disposing of the product of that labor? Monopolies are to be discouraged because of their possible abuse of power, but combinations should be encouraged because of the unquestioned advantages to be gained by the wise coöperation of all concerned in the industry.

CARL SCHOLZ,
Vice-President and General Manager,
Consolidated Indiana Coal Co.

Chicago, Ill.

Following up his excellent suggestion that well-informed representatives of the mining industry should be on hand at all state and national assemblies when mining legislation is contemplated, which was made in his letter No. 3, COAL AGE, Vol. 6, p. 798, Carl Scholz has sent the following open letter to the secretary of the American Mining Congress, of which he is the honored president:

Dear Mr. Callbreath:

I believe that one of the most important functions of the American Mining Congress should be to call attention to the crying need of sending better representatives to state and national legislatures. The enormous amount of bills against business generally that are introduced every year makes it especially imperative that any action we can bring about to remedy the situation should be taken and will certainly be of help, not only to mining, but to other industries as well.

As Senator Lewis recently stated at the Hurley dinner, in Congress alone 1000 bills were introduced last year, of which 700 affected general interests. It seems to me the chief occupation of Congress should be to eliminate all bills except those that bear the stamp of necessity, rather than to add more to the present number. There is no question that we should have more business men and fewer lawyers in our legislative halls.

CARL SCHOLZ,
President, American Mining Congress.

Chicago, Ill.

Mr. Scholz has explained clearly, COAL AGE, Jan. 9, p. 93, Letter No. 18, that this suggestion is not to be taken as advocating the principle of lobbying for any purpose of exerting an undue influence on legislators, but rather and only to give information that would make lawmakers more competent to judge of mining matters from a practical standpoint.—EDITOR.

The Layland Mine Explosion

Letter No. 3—After reading the numerous references and comments relating to the deplorable Layland mine explosion of Mar. 2, I feel it my duty as one of the apparatus party that reached the 42 miners barricaded in the tenth-left heading of No. 3 mine to give briefly a few facts of personal knowledge of the conditions and work performed at that time. In doing this I want also to correct the mistake that has been made in many of these references in regard to the apparatus used by the rescuers. There were no helmets worn, as has been stated, but breathing apparatus was used instead.

In my experience of 27 years as a coal miner in England and in this country, which has included many mine accidents and explosions, I have never known the ill-feeling and controversy that this disaster has aroused. The miraculous escape from death of so many entombed men should rather excite feelings of the deepest gratitude to Almighty God. Instead, however, it seems that a strife has arisen as to who should receive the greatest credit.

Statements have been attributed to men who I had supposed were too big and broad-minded to argue over such a matter. I cannot feel that it would be right to keep silence and permit my comrades and myself to be accused of cowardice when we knew in our hearts we were doing everything possible to be done at the time. Men who have never worn a 42-lb. apparatus on their backs are often heard to say what they could do with the same; but men who have had the actual experience in the face of danger are never boastful of what can be accomplished.

With this preliminary, permit me to state that our party of 11 volunteers from the United States Coal & Coke Co., at Gary, W. Va., were authorized by our General Manager O'Toole to make the 300-mi. trip necessary to reach Layland and to do what we could for our fellow-miners entombed in that mine. We reached the mine the day following the explosion and worked side by side with the Bureau of Mines apparatus-men every day from Wednesday evening until Friday night, when we were withdrawn from the mine so that the air current might be reversed, as I will explain shortly. It was the following morning, Saturday, Mar. 6, that 47 men escaped from the mine alive, having barricaded themselves immediately after the explosion occurred, in a portion of the mine not yet explored.

In what I have to say I want it clearly understood that Earl A. Henry, Chief of the Department of Mines, and General Superintendent Bertolet, of the New River & Pocahontas Consolidated Coal Co., were in complete control of the rescue work, and all those who went into the mine for the purpose of rescue obeyed their orders. There were eight of us wearing breathing apparatus, and we made at least six explorations, advancing 1000 ft. ahead of the brattice-men, who were busy repairing stoppings and erecting brattices to conduct the air forward. In respect to the order in which the workings should be explored, we simply obeyed orders.

It will not be necessary to describe the work that was done in exploring the mine during the 60 hr. from the time of our arrival at the mine Wednesday afternoon to Saturday morning when the men walked out of the mine alive, further than to say that Chief Henry, Friday evening, ordered three of us, Mason, German and myself, all wearing apparatus, to explore the third-main entry as far as the sixth-left heading, a distance of 3000 ft., which was at the time the return air-course for that portion of the mine already explored, the air coming through the sixth-left entry from No. 4 mine and passing out through the main-third airway.

We obeyed this order and reported to Chief Henry and Mining Engineer James W. Paul that the air was fairly good as far as the sixth-left. It was then that Chief Henry ordered all parties out of the mine and had the fans stopped, to enable certain changes to be made so that the air could be reversed the following day, when it was proposed to explore No. 3 mine beyond the sixth-left. I am confident that this decision of Chief Henry was the means of saving the lives of the 47 men who came out of the mine the following morning.

Saturday morning, as previously stated, five men walked out of the mine from the ninth-left entry, where they had barricaded themselves after the explosion. They were met at the mine entrance by Mr. Paul, mining engineer of the Bureau of Mines. They knew nothing of the 42 men remaining in the mine, and it was in the hope of saving others, who might be similarly barricaded as these men on the tenth-left entry, that the apparatus-men were hastily summoned and sent into the mine.

There were eight of us wearing apparatus out of the 14 men who at once started into the mine to endeavor to reach the tenth-left entry, not knowing the condition of the mine beyond the ninth-left heading from which the five men had just escaped. The eight apparatus-men were as follows: German, Klier, Mason, Christian, Payne, Toshie, Kovacs and myself. German and his party were the first to reach the tenth-left, where they found a note at the switch, saying that there were 42 men alive in the tenth-left heading. A messenger was at once sent back with this word, and soon Mine Inspectors L. B. Holliday and R. B. Cobb came up and assisted to tear down the first of the two brattices which had been built across the mouth of the entry by the entombed men.

The first and then the second brattice were soon torn down, and we did all we could to help those 42 men and get them safely outside of the mine. It was a sight that I shall always remember. I know my own feelings were nothing but happiness and thankfulness that it was my good fortune to have some little part in restoring these men to their homes and families. This feeling was shared by all the men from Gary, as well as by those of the Bureau of Mines and the State Department of Mines, all of whom were devoutly thankful for having been of some little service to their fellows.

In closing, permit me to say that we cannot understand the seeming attempt that has been made to belittle the work of would-be rescuers, who asked nobody for praise or credit and desired no gold medals. May I say that it is hard for one who feels he has done his duty to have imputed to him, in the public press, cowardice or failure to do whatever was possible.

In the editorial that appeared in COAL AGE, Apr. 10, p. 645, the question seems to be implied, Why were not these 47 men discovered sooner? The same suggestion appears in a brief article, COAL AGE, Mar. 27, p. 549. Later developments, however, proved that it was an all-wise Providence that directed that these men should not be discovered until Saturday morning, when the air on the main-third entry had sufficiently cleared to make their escape possible through a distance of 3900 ft.

It would be hard indeed to say what would have been the result had the apparatus-men succeeded in reaching these barricaded men on Thursday or Friday, when the afterdamp yet filled the third-main entry. We doubt not that all would have died very shortly after the brattices that protected them were removed. The truth of this conclusion is proven by the fact that Angelo Aliprandi, who carried out the note to the main entry Thursday evening, 4:30 p.m., was overcome before he could make his way back and had to be pulled through the brattices by his comrades.

I am glad to say that Chief Henry and all his district inspectors worked tirelessly and courageously. They all seemed square, manly men, which is sufficient to disprove any adverse criticism. The rescue work following a mine disaster is a poor place to look for acts of cowardice, and the Layland mine was no exception to this rule.

I am glad to indorse the suggestion made in the COAL AGE editorial, p. 645, that a suitable medal be awarded to the veteran who took charge of the 42 men, if the accounts be true, and prevailed on them to barricade themselves behind an improvised stopping and kept them brave and patient for four long dark days. Their names will go down in the annals of coal mining.

JAMES THIRTLE.

Gary, W. Va.

Electric Mine Laws

My attention was recently called to the inquiry of Fred Vinton, COAL AGE, Mar. 20, p. 516, asking for an explanation of a rule in the electrical section of the bituminous mine law of Pennsylvania which reads as follows:

For work underground, when supplied with current at a voltage higher than medium voltage, no transformer shall have a normal capacity of less than 5 kw.; nor shall a motor have a normal capacity of less than 15 b.hp.

As explained in the preamble to these rules, a "medium voltage" is understood in the law to mean any voltage over 300 and not exceeding 650 volts. The nearest commercial voltage to this requirement in electrical practice would be 2200 volts. In my opinion, there is a very good reason for limiting motors for mine use to a minimum size of 15 hp. and transformers to a minimum of 5 kw.

For example, if a smaller motor than that specified in the law is wound for 2200 volts the size of wire required would be so small that the construction would be too frail.

The same reasoning will apply to transformers. For example, a 1-kw. transformer has extremely small wire in the primary coil, and as it could readily be overloaded, the danger of a burnout is comparatively great. A 5-kw. transformer gives a wider margin for overload.

W. M. HOEN, Electrical Engineer.

East Pittsburgh, Penn.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

PUMPING FORMULAS

The formulas in common use in estimating the size, speed, capacity and power required to operate reciprocating pumps are developed from the well-known principles of mensuration. The following are the symbols employed:

H = horsepower required to operate pump;
G = water pumped or actual discharge (gal. per min.);
G_1 = theoretical capacity of pump (gal. per min.);
Q = piston or plunger displacement (cu.ft. per min.);
E = efficiency of water-end of pump;
S = piston or plunger speed (ft. per min.);
P_s = total pressure on steam piston (lb.);
P_w = total pressure on water piston or plunger (lb.);
D = diameter of steam cylinder (in.);
d = diameter of water piston or plunger (in.);
d_c = diameter of column or discharge pipe (in.);
d_s = diameter of suction pipe (in.);
p_s = unit pressure in steam cylinder (lb. per sq.in.);
p_w = unit pressure in water cylinder (lb. per sq.in.);
l = length of stroke (in.);
n = number of strokes per minute;
h = actual head or vertical lift (ft.);
h_f = friction head (ft.); . . . . . assume $f = 0.01$;
h_1 = effective head ($h + h_f + h_v$).

The most used and important of these formulas are the following, in the order of their development:

Piston or plunger speed, $$S = \frac{nl}{12} \quad (1)$$

Piston or plunger displacement, $$Q = \frac{0.7854\, d^2 nl}{1728} = 0.00545\, d^2 S \quad (2)$$

Theoretical capacity, $$G_1 = \frac{1728\, Q}{231} = 0.0408\, d^2 S \quad (3)$$

Actual capacity or discharge, $$G = EG_1 = 0.0408\, Ed^2 S \quad (4)$$
(Assume $E = 85$ per cent.) $$G = 0.03468\, d^2 S \quad (4a)$$

Diameter of column pipe, (Assumed velocity, 400 ft.p.m.) $$d_c = \sqrt{\frac{G}{400 \times 0.0408}} = 0.25\sqrt{G} \quad (5)$$

Diameter of suction pipe, (Assumed velocity, 200 ft. p.m.) $$d_s = \sqrt{\frac{G}{200 \times 0.0.03}} = 0.35\sqrt{G} \quad (6)$$

Diameter of piston or plunger, (Assume $E = 85$ per cent.) $$d = \sqrt{\frac{G}{0.0408\, ES}} = 4.95\sqrt{\frac{G}{ES}} \quad (7)$$

Velocity in discharge pipe, (ft. per sec.) $$v = \frac{231\, G}{60 \times 12\,(0.7854\, d_c)} = 0.408\,\frac{G}{d_c^2} \quad (8)$$

Velocity head, $$h_v = \frac{v^2}{2g} = \frac{(0.408\, G/d_c^2)^2}{2 \times 32.16} = \frac{G^2}{400\, d^4} \quad (9)$$

Friction head, (Vertical lift) $$h_f = \frac{f h G^2}{8\, d_c^5} = \frac{h G^2}{800\, d_c^5} \quad (10)$$

The Coal Age Pocket Book

Effective head, $(h_1 = h + h_f + h_v)$ $$h_1 = h + \frac{G^2}{800\, d_c^4}\left(\frac{h}{d_c} + 2\right) \quad (11)$$

Static water pressure, $$p = \frac{62.5\, h}{144} = 0.434\, h \quad (12)$$

Working pressure, $$p_w = 0.434\, h_1 \quad (13)$$

ESTIMATING FOR PUMPS

In pumping, the effective work of the steam-end per minute is equal to the work performed in raising the weight of water discharged each minute through a height equal to the effective head. Assuming an efficiency of 75 per cent. for the steam-end,

$$0.75\,(0.7854\, D^2)\, p_s S = \frac{62.5 \times 231}{1728}\, G h_1$$

Again, assuming a water-end efficiency of 85 per cent.

$$0.85\,(0.7854\, d^2)\, 12\, S = 231\, G$$

Then, dividing the first of these equations by the second, member by member, it is possible to estimate the ratio of the diameter of the steam-end to that of the water-end of the pump, for a given effective head and a given steam pressure in the cylinder; thus,

Diameter ratio, $$\frac{D}{d} = 0.7\sqrt{\frac{h_1}{p_s}} \quad (14)$$

Diameter of water-end, $$d = \sqrt{\frac{231\, G}{0.85 \times 0.7854 \times 12\, S}} = 5.37\sqrt{\frac{G}{S}} \quad (15)$$

Diameter of steam-end, $$D = 0.7\sqrt{\frac{h_1}{p_s}} \times 5.37\sqrt{\frac{G}{S}} = 3.76\sqrt{\frac{G\, h_1}{S\, p_s}} \quad (16)$$

Assuming, as before, an efficiency at the steam-end of 75 per cent., the horsepower required to operate a pump that will discharge G gallons of water per minute against an effective head h_1 in feet is calculated as follows:

Horsepower required, $$H = \frac{62.5 \times 231\, G\, h_1}{0.75 \times 1728 \times 33{,}000} = 0.00034\, G\, h_1 \quad (17)$$

The steam pressure required at the throttle to operate a pump of given dimensions against a given effective head h_1 is found by transposing formula 14; thus,

Steam pressure required, $$p_s = \frac{h_1}{2}\left(\frac{d}{D}\right)^2$$

Speed of Reciprocating Pumps—It is usual pump practice to estimate on a piston speed varying from 50 to 100 ft. per min., depending on the size and style of pump and numerous other conditions relating to the head or pressure against which the pump is to operate, quantity of water to be pumped, length of stroke, etc.

In general, the smaller sizes of reciprocating pumps have naturally a shorter stroke and, although run at a higher speed (r.p.m.), have a less piston speed in feet per minute, than the larger sizes, which make a less number of strokes but have a greater piston speed.

Inquiries of General Interest

Capacity of Double-Acting Pumps

Will you kindly explain what is meant by a "double-acting" pump and what is the stroke of such a pump. Also, show how to calculate the capacity of a double-acting pump when the diameter of the plunger is 20 in. and the length of stroke 40 in., assuming the pump is running at a speed of 25 r.p.m.

PUMP-RUNNER.

Greensburg, Penn.

A double-acting pump is one that pumps water at each stroke of the piston or plunger. Water is drawn into one end of the pump barrel at the same time that the water in the other end is driven out into the discharge pipe.

The stroke of a pump is the distance through which the piston or plunger moves. A pump makes two strokes to every complete revolution of the flywheel.

As shown in the accompanying diagram, which illustrates the action of a double-acting piston pump, water enters the pump through the suction pipe S. As the piston moves to the right, a partial vacuum is formed in the left end of the pump barrel, and the atmospheric pressure forces the water up the suction pipe and through the valve A. At the same time, the water in the right end of the pump barrel is forced out through the discharge valve B_1 and passes into the discharge pipe D.

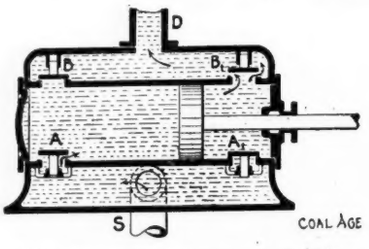


DIAGRAM OF DOUBLE-ACTING PISTON PUMP

The succeeding stroke of the piston as it moves to the left promptly closes both the suction valve A and the discharge valve B_1, while at the same time the suction valve A_1 and the discharge valve B are opened. The conditions are now reversed, and the water entering the pump through the suction pipe S passes through the suction valve A_1 into the right end of the pump barrel, while the water in the left end is driven out through the discharge valve B and passes as before into the discharge pipe D. The action of the pump is such as to produce a continuous discharge.

In order to find the capacity of a pump, it is necessary to calculate the piston or plunger displacement in cubic feet per minute or gallons per minute, as desired. The piston or plunger displacement is found by multiplying the sectional area of the piston or plunger by the length of stroke and that product by the number of strokes the pump makes per minute. Thus, in this case,

$$G = \frac{50 \times 40\ (0.7854 \times 20^2)}{231} = 2720\ gal.\ per\ min.$$

It is customary to assume an efficiency of the water-end of a pump as varying from 80 to 85 per cent. In this case assuming an efficiency of 85 per cent., the actual capacity of this pump will be $0.85 \times 2720 = 2312$ gal. per min.

Two Questions on Gases

A practical miner has asked me some questions that I would be pleased to see answered in COAL AGE. They are as follows:

1. How much carbon monoxide is present in the exhaust of a gasoline mine motor when it is suddenly moved into an atmosphere containing enough carbon dioxide to seriously affect the efficiency of the engine?

I understand this question to mean the *relative* amount of carbon monoxide in such an atmosphere, as compared with the amount that would be produced in an atmosphere free from carbon dioxide.

2. What effect has gas pressure on black powder in drill holes after they have been tamped, in the interval between charging and firing?

This last question assumes that a strong gas pressure accumulates in the hole and is exerted on the powder after the hole is tamped.

PRACTICAL COAL MINER.

Springfield Ill.

The statement of the first question is quite indefinite, as no indication is given of the extent to which the efficiency of the engine is impaired; but even if it were to be assumed that the efficiency is decreased by a certain percentage, it would still be impossible to estimate how much this condition would increase the percentage of carbon monoxide in the exhaust of the engine. For these reasons the question can only be answered in a general way.

As stated in COAL AGE, Vol. 6, p. 840, the quantity of carbon monoxide produced in the cylinder of a gasoline engine will depend largely on the supply of available oxygen. Under normal running conditions, the exhaust of the engine contains about 6 per cent. of this gas, according to a statement made by O. P. Hood, Chief Mechanical Engineer of the Federal Bureau of Mines, in his paper read at the October, 1914, meeting of the American Institute of Mining Engineers. It may reasonably be assumed that a percentage of carbon dioxide in the mine air sufficient to seriously affect the efficiency of the engine would result in greatly increasing this percentage of carbon monoxide in the exhaust gases; but the amount of this increase cannot be estimated without more accurate data.

In answer to the second question, it may be stated that the gas pressure would have no effect on the black powder of the charge in the hole. However, the presence of this gas under considerable pressure would produce a very pronounced effect when that charge of powder is exploded. The explosive effect would be greatly increased by the presence of the compressed gas. Probably the greatest effect, however, would be the extension of the flame of the explosion by reason of the presence of the gas.

Examination Questions

Pennsylvania Bituminous Mine Foremen's Examination, April 6-8, 1914

(*Continued from last issue*)

Ques.—State briefly the duties of a driver, motorman, cager, triprider and miner.

Ans.—A driver in a mine is required by law to always leave his trip in a safe place where it will not endanger other drivers or get loose and do possible damage. He must so adjust the brakes or sprags as to keep his cars under complete control. He must not allow any person to ride on a loaded car and must see that every door is closed after passing through it.

It is the duty of a motorman to look after the locomotive in his charge and permit no one to handle it but himself. He must not exceed the speed permitted by the mine foreman and must sound the whistle or other alarm when approaching switches or crossings where danger to men or animals may exist. When running the locomotive he must keep a sharp lookout ahead to see that the road is clear and the track safe. He must permit no one but his attendant to ride on the locomotive. He must see that the motors, cables and controlling parts are kept clean and in safe condition and that the headlight is burning properly when running the locomotive.

The cager at the bottom of the shaft must not attempt to remove the car from the cage or put another car on until the cage comes to rest on the bottom. When placing a car on a cage he must see that the springs or other fastenings hold the car securely from moving. The cager must not allow anyone to give signals for the movement of the cage when he is in charge.

A triprider must see that all cars are properly coupled and that the ropes are in place and attached to both ends of the trip before starting the same by giving the signal. He must examine all rope connections, chains, links, etc., to see that they are in perfect condition and report any defects he may find. He must not allow any person to ride on the full trip or on an empty trip without permission of the mine foreman. He must see that the speed of the trip does not exceed 6 mi. per hr.

The miner is required by law to examine his working-place before beginning work and take down all dangerous slate or make it safe by timbering. He must examine to see that the fireboss has left his mark at the face each morning and, not finding the same, notify the mine foreman or his assistant. If his place becomes dangerous from gas or bad-roof conditions, he must cease working at once and, placing a suitable warning or danger signal across the entrance, proceed to inform the mine foreman or his assistant of the danger.

The miner is required by law to mine his coal properly before blasting and to set sprags under the coal while undercutting the same. He must examine carefully the roof and coal after firing a shot and make his place safe before starting to work. He must order what props and cap-pieces he may need, at least one day in advance. The law prohibits the use of coal dust or other combustible material for tamping. The miner is not allowed to charge or fire any shots in a place liable to generate explosive gas, except with the consent and under the supervision of the foreman, his assistant or other competent person who is duly authorized. The law requires the miner to remain in his working-place and not to leave the same to go to another working-place without permission of the mine foreman or his assistant.

Ques.—What is the area of an airway 8 ft. wide at the top, 10 ft. wide at the bottom and 7 ft. high?

Ans.—The average width of this airway is $\frac{1}{2}(8 + 10) = 9$ ft. and the sectional area of the airway is therefore $7 \times 9 = 63$ sq.ft.

Ques.—How much air is passing in the airway, in the last question, when the anemometer makes 165 r.p.m.?

Ans.—This reading of the anemometer, for all practical purposes, indicates a velocity of the air current of 165 ft. per min. The quantity of air passing in the airway is therefore $165 \times 63 = 10{,}395$ cu.ft. per min.

Ques.—What are the chief causes of mine fires and how would you proceed to guard against them?

Ans.—The chief causes of mine fires are the accidental ignition of gas blowers when blasting coal; or the ignition of fine coal and slack by spontaneous combustion in waste and abandoned places in the mine; or the use of open lights in stables, pumprooms, enginerooms and other places where hay, waste and like combustible material are used; or by the short-circuiting of electric currents, or the blowing out of fuses, or the ignition of gas by the sparking of wires. Mine fires may result from a local explosion of gas or dust at the working-face.

The best safeguards against mine fires are the prompt removal of the possible causes of fire, by loading out all fine coal and slack, the use of protected lights in stables, pumprooms, etc., and the enforcing of strict rules in reference to blasting and gas.

Ques.—The water gage being 1 in. and the volume of air in circulation 50,000 cu.ft. per min. in a certain mine, what will be the volume of air in circulation in this mine when the water gage is increased to 1.6 in., the increase being due to an increase of power on the air?

Ans.—Since the increased water gage is due to an increase of power, and not to any change in the mine airways that would cause an increased resistance, the quantity varies as the square root of the water gage. In other words, the quantity ratio is equal to the square root of the water-gage ratio. Then, calling the required quantity of air x, we have

$$\frac{x}{50{,}000} = \sqrt{\frac{1.6}{1}} = \sqrt{1.6} = 1.265$$

and $x = 50{,}000 \times 1.265 = 63{,}250$ *cu.ft. per min.*

Book Reviews

A Manual of Shaft Sinking

THE SINKING OF SHAFTS. Vol. II of Modern Practice in Mining. By R. A. S. Redmayne, Chief Inspector of Mines in Great Britain, late professor of mining, University of Birmingham. pp. xiv + 270 + 5 index; 5½x8¾ in. 172 ill., 2 being folded charts. Longmans, Green & Co., 443 Fourth Ave., New York City. Price, $2.25, cloth boards.

There is no more comprehensive and authoritative book on shaft sinking than this volume by R. A. S. Redmayne. It is well illustrated throughout, and only about two dozen of the cuts are halftones. The greater part of the illustrations are line-cuts, which involve more labor and expense to the author and publisher, but which tell their lesson so much more completely, rapidly and accurately.

A Shaft Mine with about Three Acres of Territory

Mr. Redmayne does not spend much time on the history of shaft sinking, but the following note will be found of interest:

Up to the time of the invention of the atmospheric engine in 1810 by Thomas Newcomen, mine shafts were much limited in point of depth by reason of the difficulties in raising the water. The maximum depth attained by colliery shafts in Great Britain was about 360 ft., their diameter being seldom, if ever, more than 7 or 8 ft., and the area of coal worked by one shaft rarely exceeding a radius of 200 ft. with the shaft as a center. Fifty years later, amid great rejoicing, Walker colliery, on the banks of the Tyne, was sunk to the Main-Coal seam, at a depth of 600 ft. from the surface, a medal being struck to commemorate the event.

The Deepest Shaft

From such shallow shafts the coal industry has progressed until now there is one, the Providence shaft in Belgium, No. 18 pit, Machienne collieries, which, Mr. Redmayne states, is 3937 ft. to the bottom of the sump and which in 1908 had its lowest hoisting level at 3707 ft. Of course this depth is exceeded in several metal mines, notably the No. 5 shaft of the Tamarack copper mine in northern Michigan, which, by the way, is deeper than No. 3 shaft of the same Tamarack Mining Co., though the latter is declared by Mr. Redmayne to be the deepest in the world.

The No. 5 shaft is 28 ft. over a mile in depth, or 5308 ft. The shallower shaft reaches a depth of 5253 ft., and in the workings there is a blind slope on the dip of the bed, 800 ft. from the main shaft, which is 406 ft. long. So No. 3 shaft, though not as deep as No. 5, gives access to an even profounder depth. Apparently the Ashton Moss coal shaft in Lancashire is the deepest in England, with a depth of 2880 ft.

The author in his introduction discusses the position, shape, size and requisite number of shafts on a mining property. In the next chapter he deals with elementary methods of sinking. The third chapter discusses drilling and blasting. Then follows a description of the processes of sinking and lining shafts. Another chapter is devoted to drainage, ventilation and sinking and is followed by yet another in which the arrangements for sinking and the costs of sinking and lining are discussed at length.

Methods of Shaft Sinking

The methods described in the last two chapters are extremely interesting, though for the most part they reflect conditions far more severe than those with which we have to cope in America. The first systems described are those using wood and steel piling. In the latter the shapes used by the Interlocking Channel-Bar Co., of Chicago, and by Charles Walker, of England, are described. Here it might be pointed out that more space might have been devoted to American sheet-piling methods. The author has not given them the attention they deserve. Then follows an account of the system of Haniel & Lueg, in Düsseldorf. One of the drawings illustrating this German method we have reproduced, and it accompanies this article.

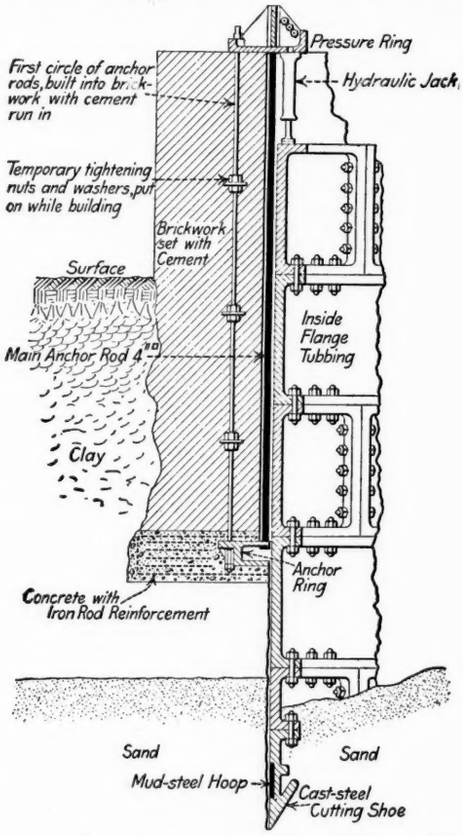
The sand shown in the lower part of the illustration lies so near the surface that it is necessary to build up the shaft with brickwork set in cement so that there may be sufficient weight against which the hydraulic jacks may be braced in pressing down the cutting shoe into the water-logged sand. The sand is removed by hand or by a clamshell bucket. In some cases a peculiar device called a sack-borer is used; this scheme though old has been greatly improved by Sassenberg & Clermont.

Sinking under Water

The Haase system uses a piling of wrought-iron tubes; the Honigmann method drills the shaft under a pressure of muddy water which prevents the sides from caving. At the same time a current of water is established in a pipe which forms the spindle of the boring tools. This water rapidly removes the sludge formed by the action of the cutting edges, and this is aided by the lifting action of air, which is discharged within the pipe mentioned. Of course this device is suited for work in quicksands only.

Some Percussive Methods

The Pattberg percussive borer is a large tool occupying the full diameter of the shaft. It cuts and crushes the soft rock. The cuttings are washed from the cutting faces by water under a pressure of about 1000 lb. per sq.in., and air, compressed to 1100 lb. per sq.in., lifts these cuttings from the



HANIEL & LUEG'S SYSTEM OF ADVANCING SHAFT KNOWN AS THE SINKING-DRUM PROCESS

shaft. The borer has a stroke of 8 to 12 in. and makes 60 to 70 strokes a minute.

The well-known Kind-Chaudron method, where the rock is drilled by a giant trepan, later receives attention. It also hails from Germany. Another German device is a shaft-boring apparatus worked by intermittent hydraulic pressure called by the author "shock." There are six bits which are so operated. The pressure is switched on or off by a valve which controls all the boring bits at once. The pressure is opposed by retractive springs which lift the bits when the hydraulic pressure is relieved. The cuttings are removed by the flushing of water.

The pneumatic or compressed-air system, which might be better described as the caisson method, is also discussed. This was invented by a Frenchman over 60 years ago.

The process of preparing a shaft for sinking by cementing the measures around it was first tried in the Béthune colliery in Pas-de-Calais, now just within the British army lines. The congelation process, in which the measures are frozen, was invented by Poetsch in 1883, though the process in a modified form had been tried in Wales as far back as 1862.

The author says nothing about methods of cementing the cracks in the measures in sinking nor about the sealing of shafts by pumping cement mortar or other material into the measures around the shaft. In fact, while Mr. Redmayne shows a somewhat complete knowledge of European practice, he does not seem to be as well acquainted with American methods.

Costly Shaft Sinking

A quotation from page 2 of this volume may well conclude this review. It shows clearly how great the problem of shaft sinking is in Europe and why invention has been so greatly stimulated, especially on the Continent.

A still more costly sinking was recently made in Belgium, where the putting down and lining of two pits through 1968½ ft. of water-bearing strata cost about $2,338,000 and a further 338 ft. in coal measures cost about $20,000, or a total cost of roughly $2,358,000—equivalent to nearly $511 per ft. sunk and lined. The full cost in sinking and equipping the colliery amounted to $3,394,000.

A book like the one we are reviewing it would not pay to write in America as the demand for it is so limited. For this reason we believe no legislation should be passed restricting the importation of foreign books. While they describe oftentimes processes of much value to a few people in America who have great need of them, a book about such methods is not of such general interest that native talent is likely to be engaged in writing it.

A Pioneer in Mine Accident Prevention

GREAT COLLIERY EXPLOSIONS AND THEIR MEANS OF PREVENTION. By W. Galloway. pp. viii + 130. 5⅝x8½ in. 24 ill. and 11 plates. The Colliery Guardian Co., Ltd., 30 and 31 Furnival St., Holborn, London, E. C., England, 1914. Paper cover.

This book being in small type contains an immense amount of information. It is a reprint of papers mostly read before British societies by the author, the first dating back to 1872. Many of these are printed here at greater length than in the societies' proceedings. The relation of Mr. Galloway to the present state of knowledge regarding mine explosions is most intimate. The industry owes him a great debt for his work.

An Article in 1872 on Explosions as a Result of Weather Conditions

The first paper discusses most completely the connection between explosions in collieries and weather, Robert H. Scott, the Director of the Meteorological Office, collaborating with him in its production.

Another paper on the same subject followed in the next year, being read before the Meteorological Society. In those days the importance of barometer and temperature readings was far greater than today, for the ventilation was either natural or only feebly assisted. Fans such as the Waddle were just beginning to be introduced. Consequently the weather conditions needed close observation.

In 1874 Mr. Galloway addressed the Royal Society on his experiments with safety lamps, some of which on the protective action of gauze dated back to early in 1872. He urged in this paper the effect of the sound wave in aiding the passing of a flame through gauze. A description of the explosion in the Llan colliery near Cardiff, reprinted from an issue of "Iron" in 1878, then follows in which the author discusses the influence of coal dust in extending explosions and even starting them if any gas is present. This article is followed by several from the "Proceedings" of the Royal Society, 1876 to 1884, on the influence of coal dust in colliery explosions.

Galloway Urged Stone-Dusting in 1896

Before the Royal Commission on Explosions from Coal Dust in Mines in 1891, Mr. Galloway urged the using of dust-tight mine cars, and in a letter addressed to the London "Daily Chronicle" in 1896 he says:

I would suggest that the adoption of one or the other of the following alternatives be made compulsory in every dry and dusty mine: (1) All roadways along which coal is being hauled from the working-places to the shaft shall be kept damp continually, and all roadways which have ever been, but are no longer, used as haulage-roads shall have the coal dust cleared from them and be thereupon liberally coated all over with fine dried clay dust. (2) All roadways which are, or ever have been, used for the purpose of hauling coal shall be coated with dried clay dust throughout their entire length and a similar coating shall be applied from time to time at regular stated intervals to all roadways which continue to be used as haulage-roads.

We are unable to understand why this book was published. A reprint is never so satisfactory as a new and uptodate statement of facts. If it is a defense of Mr. Galloway's work as a pioneer it largely fails to produce the right effect, because the author merely reprints his papers without any statement relative to their originality or to the opposition they aroused.

Anyone at all well acquainted with the chronological history of mining will realize, however, that Mr. Galloway has been in the forefront for many years and is one of the original thinkers among the many which the mining profession of Great Britain has produced.

An Institute Issues Its Proceedings Monthly

WEST VIRGINIA COAL MINING INSTITUTE BULLETIN.—E. N. Zern, editor, Morgantown, W. Va. pp. 40. 6x9 in., 2 ill. Paper cover. Monthly issue.

We welcome a new child to the large family of coal-mining publications. The mining industry will surely "not be ashamed when it meets its enemy in the gate" with such a bunch of healthy children if this last born is a fair sample of the others.

The editor under the head, "A Patient, a Prescription and a Plea," most aptly describes the reason why the bulletin was started. It was founded as a last resort when the institute support failed, as has happened all too frequently in other states of recent years. Some of us who believe it takes a little fortune to start a paper of course are not convinced that it is a job for a deficit to tackle, and some of the editors of this paper and of other state institutes are going to put E. N. Zern on the "unfair" list for undertaking to publish a bulletin on the pittance of a state institute editor, especially to venture with such a compensation to put such a generous amount of care and good will into his work.

Is the Survey of West Virginia to Be Discontinued?

In the columns of this new periodical, Dr. I. C. White discusses the work of the State Geological Survey and deplores the fact that the necessary funds for its continuance may not be received from the state. Nineteen counties out of 55 are not yet surveyed geologically, and one-fourth of the whole area of the state has not been mapped topographically. As Dr. White says, "It is simply inconceivable that the legislature should stop the survey permanently and thus commit such a great injustice to the 13 counties of the state which have borne their share of the cost of making the 36 completed 'detailed county surveys' and of the topographic surveys in the 40 completed counties."

Tribute to Fred Keighley

"Stray Currents" is a series of short editorials ending with a tribute to Frederick C. Keighley, of Uniontown, Penn. Those who knew him—and few there were in Pennsylvania and West Virginia who did not—recognize the justice of the statement, "He was a leader in thought, progressive in action, a light to the industry and an inspiration to all favored with his friendship."

Two papers from the December meeting follow—one by Richard Smethurst on "Cost and General Accounting" and one by Frederick C. Keighley on "A Contemplated Method of Meeting the Difficulties Encountered in Mining Coal under Friable Roof in Connection with a Very Soft Floor or Bottom."

The "Ring of Steel" Around West Virginia

A cartoon originated by Wightman D. Roberts and drawn by M. B. Aleshire, a Huntington cartoonist on the Chicago "Tribune," shows West Virginia surrounded by enemies in Ohio and Pennsylvania. Mr. Roberts has great respect for the preparedness of his rivals, depicting them with a large mortar, a big armored motor car, protected with a Red Cross flag, many shells and an aëroplane. The West Virginians are taken entirely unprepared and are seen sitting on benches. They have only Mother Jones, a hound and much gas at 5c. per thousand cubic feet wherewith to asphyxiate their opponents. The "Bulletin," we suspect, is not neutral. When we see the genial smiles on the faces of the Pennsylvania coal operators we really believe that trouble may yet be averted.

It is the custom at many collieries, as pointed out by A. Mitton Dury in a paper before the Manchester Geological & Mining Society, to drive ahead narrow roads for prospecting. Blowers of gas often discharge in such narrow roads, and this gas may be distributed along the course of the workings to points where shots are being fired. Mr. Dury asks if it would not be wise to provide that, where a road is not in use at any time, it shall be kept entirely free from gas or be so built off that no dangerous quantities can escape.

Coal and Coke News

Harrisburg, Penn.

The Senate, on Apr. 21, passed finally the Catlin Bill No. 160 to bring anthracite miners under the proposed workman's Compensation Act. The final effort of the operators was to amend the bill regarding the definition of a miner, it being their contention that the bill, as finally amended on Apr. 20, was by far too severe.

According to the bill the term "miner" means the person who cuts or blasts coal or rock at the face of a gangway, airway, breast, pillar or other working place. The operators wanted this definition to include also any person engaged to do general work in a mine and qualified to do the work of a miner.

Another thing fought for by the coal companies was to keep the new act from becoming operative until Jan. 1, 1916.

The bill now goes to the House where the miners do not anticipate any serious trouble, for in the past this body has always been favorable to the miners, and the Senate, the pit in which all mining bills perished.

The Catlin bill accomplishes the following for anthracite workers.

1. Makes the mine operators responsible for injury to a workman if the injury is caused by the negligence of the mine foreman, assistant mine foreman or any person in charge of the mine or any part thereof. This places the mine operator in the same position as all other employers with respect to liability.
2. The anthracite coal miners go under the workmen's compensation law, if such law is enacted.
3. The word "miner" is positively defined.
4. An adult member of the family of a man killed in the mines has the right to examine witnesses at a coroner's inquest and counsel for the family also has the right and may explain the law to the coroner's jury.
5. None others than miners will be allowed to fire blasts.

Amount and Distribution of Coal Tax Still Indefinite

Nothing definite resulted at the conference of the representatives from the anthracite counties with the Ways and Means Committee, with respect to the amount and distribution of the tonnage tax, as covered by the Dawson bill, but there were several important developments.

One is that the Governor is standing by his proposition to have the distribution 60 per cent. to the state and 40 per-cent. to the anthracite counties.

The other is that it has not been decided whether the amount of tax under the Dawson bill shall be 2½ or 3½ per cent. ad valorem.

The committee also gave a hearing to the operators to protest against any increase in the anthracite tonnage tax levy, and incidentally to bear witness that the Roney Act of 1913 is a burden.

One of the most remarkable arguments on behalf of the coal companies was made by W. H. Williams, vice-president of the Delaware & Hudson Co. of New York. He emphasized these points. That in spite of the immense dividends, the Lackawanna Coal Co. is earning only 4½ per cent. on its capitalization; that the coal companies have not increased the price of coal during the past 10 years, that the approaching termination of the miners' agreement will mean increased costs in production, and finally, that the legislature will impose upon consumers of coal an increased price of 10 cents merely by the enactment of the workmen's compensation bill.

Mr. Williams' explanations of the slim earnings, in spite of the occasional melon cut in Wall Street, was that this company was able to pay large dividends for the reason that money earned in previous years had not been expended, and the surplus has always been large. The Hudson company is paying taxes on $20,000,000 worth of property, when its capitalization is $43,000,000, but this capitalization, he said, included some railroad property.

Major Everett Warren, James H. Torrey and Ex-Judge Frank Wheaton presented arguments to show that the imposition of the tonnage tax is a burden which is causing lessees of coal land actually to lose money, as in many cases the coal royalties paid do not overbalance the anthracite tax, amounting to 7 cents a ton.

Mr. Torrey insisted that the coal companies are being over burdened, the Hudson company, he said, is earning less than 6 per cent. and now the Catlin bill will make the operators liable for damages for injury to the workmen, and the operation of such an act would increase the cost of coal 10 cents a ton. This statement is made in contradiction to the assertion of the Attorney General at a hearing some time ago that the compensation cost could be met by one cent a ton increase.

It was also brought out that coal company taxes had jumped five times in 10 years.

Vice-President Williams of the Hudson company said that while in 1902 the cost of production advanced 17 per cent. by reason of the strike, and that in 1912 another increase amounted to 7 per cent., the price of coal remained stationary at tidewater. The smaller sizes of coal are sold, he said, for less than the cost of production. Companies are selling less steam sizes than three years ago because of competition with bituminous coal and coke and that at the present time anthracite conditions are chaotic. "We have stored 236,000 tons of coal in the winter months," he said significantly. "The wage agreement with the miners comes up next year and we must protect ourselves against a strike."

One of the reasons for hard times in this country, Major Warren says, is the anthracite tonnage tax. The retailers say they find lessened opportunity to sell anthracite, people shake their grates less frequently and the result is a decreased production. "The companies I represent mined 1,000,000 tons less in one month as compared with a year ago. At the ground of all assaults upon anthracite companies is the increased price. We are charging too much. You add a tonnage tax. The result is a lessened production."

Commission to Investigate Rise in Coal Prices

Senator Vare has introduced a joint resolution, providing for a commission to investigate and report on the increased cost of anthracite coal alleged to be due to the tax imposed in 1913, which reads as follows:

Whereas . . . An act laying a tax on anthracite coal and providing for the collection and distribution of the same, the tax or two and one-half per cent. was imposed upon the value when prepared for market of every ton of anthracite coal which said tax did not on the average exceed five cents per ton and

Whereas, The operators of the anthracite coal mines, although refusing except in a few isolated instances to pay tax or any part thereof and although contesting the validity thereof in the courts, and it having been stated publicly in the press of the state and not denied that they have combined either among themselves or with retailers to raise the price of anthracite coal and did actually raise said price 25 cents per ton, upon the pretense, that the said amount was for the purpose of paying said tax, therefore:

Be it enacted, etc. That a commission of three be appointed by the Governor to serve without compensation to investigate the cause of causes of the rise of said price of anthracite coal, either by operators of anchracite mines or dealers in anthracite coal, whether the same was justified or not, and whether the same was done as a result of any illegal combination or confederation upon the part of the operators of anthracite coal mines or dealers in anthracite coal, and investigate and report all other facts and circumstances in reference thereto, said commission to report to the Governor on the first of January, 1916, and make a further report to the Governor and to the Legislature on the first day of January 1917.

For the purpose of enabling said commission to carry out and perform its duties, the said commission shall have the right to sit in any part of this Commonwealth and shall have power to compel the attendance of witnesses and the production of books, papers and other evidence at the meeting of the commission and for that purpose may issue subpoenas signed by the president of the commission and cause the same to be served and executed in any court of the Commonwealth and if any witness refuses to testify any fact within his knowledge or to produce any books or papers within his possession or under his control, the secretary of the commission shall forthwith report the facts and of such refusal to the court of Common Pleas of the county wherein such witness resides or wherein his attendance was required and all questions arising upon such refusal shall at once be heard by said court. If the court determines that the testimony or evidence required by such witness is legal and properly competent and ought to be given or produced by him, then said county shall make an order commanding such witness to testify or produce books or papers or both as the case may be and if such witness shall thereafter refuse to testify or produce books or papers as aforesaid in disobedience of such order of the court, then the said court shall have the power to order the commitment of such witness to the county jail of the proper county for contempt.

The sum of $10,000 is appropriated for the expenses of the commission.

The bill to bring clay, ore and graphite mines and stone, slate, marble and granite quarries of the state under the supervision of the Department of Mines, and to be inspected by the various mine inspectors has been so amended, that the real purpose of the bill is killed. Section 1 reads as follows: "That on and after the passage of this act the clay quarries or mines of Pennsylvania in which bituminous coal is also mined shall be operated under the supervision of the State Department of Mines and shall be subject to such rules and methods of operation as may be recommended by the Chief of the Department of Mines in accordance with such provisions of the coal mine laws of the state as may be found applicable to the supervision of clay quarries or mines." The words ore and graphite mines and stone, slate, marble and granite have been stricken out.

The bill creating a Division of Boiler Inspection in the Department of Labor, and regulating the inspection of steam boilers has been so amended that Section 4 of this bill, now reads "Provided, That nothing in this section shall refer to boilers in cities of the first, second and third class and in those counties for which special laws have been enacted for the inspection of steam boilers and boilers in use at or in connection with coal mines.

Concerning Stream Pollution

Senator Crow has introduced a bill to amend Section 16 of the Act of May 1, 1909, which will no doubt be closely watched by bituminous interests, as several suits have been started by state fish wardens against coal operators in the western part of the state for violations of this act. The amended section is as follows: "That it shall be unlawful for any person to put or place in any waters within the Commonwealth any electricity or any explosive or poisonous substances whatsoever or any drug or any poison bait for the purpose of catching, taking, killing or injuring fish or to allow dye stuff, coal or gas tar, coal oil, sawdust, tan, etc., to be turned into or allowed to run, flow, wash or to be emptied into any of the waters aforesaid, unless it is shown to the satisfaction of the commissioner of fisheries or the court that every reasonable and practical means have been used to prevent pollution of waters in question, by the escape of deleterious substances. In the case of the pollution of waters by substances known to be injurious to fishes or to fish food, it shall not be necessary to prove that such substances have actually caused the death of any particular fish. Provided that nothing in this section shall prohibit the use of explosives for engineering purposes when a written permit has been given therefor by the proper national, state or municipal government and Provided further, That nothing in this act shall apply to waters pumped or flowing from coal mines into waters within the Commonwealth."

PENNSYLVANIA

Anthracite

Sugar Notch—Alarmed at the rapid spread of forest fires in this vicinity, Burgess John Riley issued a call on Apr. 21 to the citizens asking them to organize fire fighting forces to battle with the flames that threaten to destroy much valuable timber and probably damage the town. Two collieries operated by the Lehigh & Wilkes-Barre Coal Co. were in danger. They furnish employment for practically every male resident of the borough. Officials of the collieries called the employees to the workings and instead of sending them to their work inside the mines, organized the men and boys into fire-fighting brigades.

Wilkes-Barre—Examination of men who desire to qualify as candidates for mine inspectorships in Luzerne and Carbon Counties was conducted in the Court House on Apr. 20, 21 and 22. Twenty men took the examinations. The terms of all the mine inspectors expire this year and all are taking the examination. The candidates include the seven present inspectors, nine mine foremen, two miners, one former mine inspector and one assistant mine foreman. The Board of Mine Inspectors' Examiners who held the examination were John J. Hanlon, chairman, Patrick Dougherty and Daniel J. Bolton, practical miners; E. R. Pettebone and A. B. Jessup, mining engineers.

Tamaqua—During the year 1913 the Alliance Coal Co. operating the Kaska colliery near Middleport encountered a number of hindrances to the operation. Facing these conditions the operation was closed on Dec. 24, 1913. For several months the force of outside employees was kept cleaning up and shipping material to other collieries, the pumps were finally withdrawn and the shaft allowed to fill with water. This colliery adjoins the profitable and busy Silver Creek operation of the Reading company and since pumping has stopped, the latter colliery has felt the effects of the water from Kaska in some degree. In order to safeguard the men from possible drowning should the water break the barrier pillars between the two mines, the Reading company has a force of men drilling proving holes in the third level of Silver Creek shaft, to ascertain the exact thickness of the veins which lie between them and the water stored in the Kaska shaft. The presence of officials of the interested companies making tests at the abandoned shaft caused the loosing of a number of unfounded rumors concerning the early resumption of the place. Contrary to printed reports none of the former employees have been asked to report and the watchmen are the only men about the plant.

Pottsville—Owing to the extraordinary dry weather considerable areas of woodland are being swept by fires, which are in a number of instances getting into proximity to large culm piles. Some of these contain many thousands of tons of combustible material. The state police are aiding in fighting these fires.

Bituminous

Connellsville—The production of Connellsville coke recently amounted to 298,000 tons per week, while shipments were at the rate of 295,000 tons. The number of active merchant ovens were increased by 200 and better running time has been made in those in operation, the result being an increase in production of approximately 5000 tons per week.

Pittsburgh—The stages of the three rivers recently reached the lowest point recorded in more than 50 years for this season, and Pittsburgh coal operators with 4,000,000 bu. of coal awaiting shipment were facing a situation almost unprecedented in the history of western Pennsylvania water traffic. It is seldom that shipping on the river has been interrupted by low water before July 1, for longer than a week or so at a time. No coal has left the Pittsburgh harbor since Feb. 20. As a result barges have accumulated until more than 500 are tied up in this vicinity at the present time. It is estimated that it will require 25 tows to remove the coal now lying in the local harbor.

Tarentum—The tipple, brickmaking plant and boiler house of the Cornell Coal Co., near here were recently damaged by fire to the extent of $15,000. This fire originated in the boiler house. The mine will be shut down for a few days until temporary repairs can be made.

Brownsville—E. S. DeArmit, division superintendent of the Knob Albany and Chamouni Mines of the Monongahela Consolidated Coal & Coke Co., and Joseph Barshotti were instantly killed in the Knob mine, Apr. 21, when 30 ft. of solid rock fell upon and buried them. DeArmit, Barshotti and Richard McKenna were inspecting rails in the mine. McKenna narrowly escaped being buried with the other two men.

Irwin—The University of Pittsburgh evening course in the principles of coal mining, conducted by Robert M. Black, assistant professor of mining, closed on Apr. 21. This course is the second years' work in the program in the University extension outlined by the School of Mines. Those receiving certificates of proficiency were William H. Evans, Albert H. Jones, John W. Luteman, Joseph W. Rymer, and James M Stein.

West Virginia

Clarksburg—The Consolidation Coal Co. recently began shipments of coal to the Lakes. This trade will increase the output for some time at least. Only those mines operated before the trade started will be run; it being the intention to increase the daily output of these operations.

Charlestown—The Crown Hill mines of the National Bituminous Coal & Coke Co. were sold at auction Apr. 22, to satisfy a judgment obtained by the heirs of the Hasford estate upon which the mine is situated. But two bids were offered and the property was sold for $1800. At the time of the purchase by the National Bituminous Coal & Coke Co., the consideration named in the transaction was $60,000.

Grafton—The loading record of the Monongah Division of the Baltimore & Ohio R.R. was recently the largest that it has been in any single day since last summer. The number of cars loaded of all commodities amounted to 1368, the largest previous record was 1605, which was made during the rush of business last year. Eleven hundred and thirty-five cars of coal and coke entered into the 1368 of the recent record, the remainder being various commodities with lumber in the majority. Cars are being rushed into the district to insure an ample supply to carry the increased shipments, and the railroad company anticipates no difficulty in handling the business, no matter how much increase it may show.

Fairmont—The Baltimore & Ohio R.R. recently put the Underwood night train and crew to work to haul empty and loaded cars to and from the Jamison mines. The opening of the Lake trade and the demand for coal made this necessary. About 110 cars is the average being loaded at the

Jamison mines at the present time—the normal loading capacity being 140.

An extra train and crew have also been put on the Chiefton run at night. About 145 cars are being loaded daily on this run and two train crews are kept busy day and night handling the traffic.

Another indication of the resumption of business activities in the Fairmont region was the order recently issued by Manager H. H. Watson for the resumption of full time at the shaft mines of the Consolidation Coal Co. This plant when working to normal capacity gives employment to over 300 men and was practically closed down last fall when orders for coal ceased to come in. The Lake season is now open and with orders plentiful this mine as well as others now operating will devote its coal to Western shipments.

VIRGINIA

Bristol—Due to a drought in the southwest Virginia mountains, coal mines and mining plants have been threatened by forest fires for some time. These fires have made such progress as to require the efforts of hundreds of miners to protect the mines and plants at the Inman operations near Appalachia and also at the plants of the Stonega Coal & Coke Co. at Stonega, the Virginia Lee mines in Lee County and other mining operations in their vicinity. The Stonega Coal & Coke Co. is said to have lost considerable timber while its plants have been protected only by determined efforts.

Appalachia—Four hundred miners on Apr. 20 escaped from a fire which started in the Inman mines Nos. 1 and 2, owned by the Virginia Coal & Coke Co. Mine inspectors reported this escape was due to improved facilities.

TENNESSEE

Knoxville—Optimistic reports of committees featured in the quarterly meeting of the Southern Appalachian Coal Operators' Association recently held in this city. Each of the reports showed that business was becoming much better and indications were that a prosperous year is ahead. Operators representing all parts of the Appalachian region were present and discussed the improved conditions in their respective territories.

KENTUCKY

Pineville—Sale of the lease and property of the Luke & Drummond Coal Co. in Bell County has been ordered in the case of H. W. Sanford and others against the coal company by the United States Court in which the suit has been tried. The sale will be conducted by L. C. Gunter, receiver. The company has a lease of 1600 acres and a well equipped plant.

A feature of the fourth annual meeting of the Kentucky Mining Institute, which will be held here on May 14 and 15, will be a state wide first aid meet, which the committee in charge is endeavoring to make the most interesting of all similar contests ever held in Kentucky. A large number of valuable prizes have been offered for the winners and it is expected that the American Mine Safety Association will announce a schedule of medals to be awarded. All over the state, according to reports received here, rescue teams are drilling in preparation for the contest and the various events promise to be hard fought. Numbers of papers on important topics will be read and trips will be arranged to the mines in the vicinity of Pineville.

Fleming—There has been a marked increase in tonnage for the mines of the Elk Horn Mining Corporation and everything points to a gradual resumption of work at all mines in the near future. The company is working full time and is increasing tonnage as fast as it can get the men necessary to do so.

Barbourville—The coal mining industry in southeastern Kentucky seems to be on the eve of a revival after a temporary shutdown. Operators in Harlan, Bell, Knox and Whitley counties report an increasing business with large orders from points of consumption. Mines have not yet resumed full time but orders on hand insure a steadier run than there has been for several months past.

OHIO

Columbus—Failing to secure favorable action on his bill to fix maximum freight rates on coal in Ohio, Senator Vorheis has introduced in the Ohio Legislature a joint resolution calling upon the State Utilities Commission to immediately investigate intrastate rates on coal. The resolution states that the leadership of the state in the coal-mining industry is being imperiled by alleged discriminatory rates on coal shipments. It is believed there will be no substantial objection to this joint resolution in either house.

INDIANA

Clinton—The J. K. Dering Coal Co., of this city, has just distributed to the mine bosses, stable bosses, weigh bosses and other heads of departments prizes amounting to $1000, for efficiency in their departments. The prizes ranged from $15 to $100.

Indianapolis—Delegates representing coal operators who mine about 80% of the coal output of Indiana visited Washington, Apr. 20, seeking permission to establish a selling agency to handle their entire output. The committee made its representations to the Federal Trade Commission and later conferred with one of the assistants to the Attorney-General of the United States and the Department of Justice officer who is in charge of trust prosecutions. The coal operators said they desired to avoid violating the Sherman anti-trust law. They said they wished simply to reduce the cost of marketing their output; that there is now much cut-throat competition. It is said the federal officials intimated that the coal companies might be permitted to effect a limited combination for purposes of conservation. The delegation represented 114 mining companies whose properties are valued at $30,000,000.

ILLINOIS

Taylorville—The Mammoth mine of the Christian County Coal Co., located near Taylorville, was sold Apr. 20, to the Peabody interests of Chicago, owners of a number of coal mines in central and southern Illinois. The price paid was $185,000; $50,000 being in cash and a mortgage given for the balance. This mine was sunk in 1900; the company owning it being incorporated for $100,000. It is said that dividends to the amount of $190,000 have been earned; $90,000 of which have been paid back into the company in acquiring new coal rights and in making repairs.

Pawnee—Many coal miners in this section are seeking work on farms; they believe that the local mines will resume operations in the fall, and hope to keep employed between now and that time.

Canton—Following close upon the suspension of activities at the Maplewood mine No. 2, at Farmington, came the announcement that the Simmons mine, north of Canton, would close indefinitely. This makes the third mine in this section that has closed down recently, the mine at Norris being the first.

MINNESOTA

Virginia—H. O. Johnson recently returned from a trip to Mentor, Polk County, where he started the first drill at work in that section, exploring what is believed to be a bituminous coal field of considerable extent. Mr. Johnson believes there is no question about the Polk County coal field, and thinks that large measures exist there of a good grade of bituminous coal. It is also claimed that anthracite has been found. It is believed that these deposits at Mentor are distinct from the lignite beds in the northwestern section of the state.

COLORADO

Trinidad—The selection of a jury to try John R. Lawson, international board member of the United Mine Workers of America, charged with the murder of John Nimmo, a mine guard, on Oct. 25, 1913, began in the District Court here, Apr. 21. Talesmen were examined by Attorneys H. N. Hawkins for the defense and Deputy Attorney General Norton Montgomery for the state.

UTAH

Price—The coal and coke trade of Carbon County is steadily improving as is evidenced by the fact that 600 ovens out of about 700 are going at full capacity at Sunnyside, while the reserve coke stored at that plant and amounting to several thousand tons is now exhausted. Considerable coal for railroad use on the east end of the Denver & Rio Grande is also coming from Sunnyside while something like a dozen cars a day goes to the gas and commercial coke plants at Salt Lake City. It is believed that the mines and coke ovens will be kept going fairly steadily throughout the entire summer. At present five days per week are being worked, with the prospect that this will soon be increased to seven.

PERSONALS

J. B. McClary was recently reëlected president and general manager of the Yolande Coal & Coke Co. No changes were made in the organization of this firm at the election.

Samuel Dixon who for 35 years was a resident of Fayette County, W. Va., being identified with several of the large coal operations, is making arrangements to return to this county. He is to be at the head of a sales agency, handling

the output of the Deegans interests. Mr. Dixon will also handle a couple of Loup Creek operations.

C. H. King has been appointed general agent of the coal and ore department of the New York Central lines with headquarters in Pittsburgh. Mr. King succeeds M. D. Flanigan who resigned to enter other business.

Alexander Thompson, aged 71 years, foreman for the Pennsylvania Coal Co. at No. 4 shaft, is critically ill of pneumonia in St. Frances' Hospital, San Francisco. He was stricken while on a pleasure trip to the West, incidentally the first vacation he had taken in his 50 years' work for the company. He is president of the City Planning Commission of Pittston.

Neil Robinson, of Charleston, W. Va., who was a few weeks ago appointed temporary receiver for the LaFollette Iron Co., was recently appointed by the Federal Court of Knoxville, Tenn., permanent receiver for this company, with Daniel D. Carter, cashier of the East Tennessee National Bank of Knoxville, as co-receiver. The furnace of this company at LaFollette is still being operated. Mr. Robinson is also receiver for the LaFollette Coal, Iron & Ry. Co.

OBITUARY

Francis S. Lambie, 48 years of age and a coal operator of Clarksburg, W. Va., died at his home recently. He is survived by his widow, two sons, and one daughter.

A severe attack of pneumonia caused the recent death at his home in Allentown, Penn., of William C. Walters, connected with the Lehigh Valley Coal Sales Co. Mr. Walters, who was 40 years old, entered the employ of the coal company at an early age, and never severed his connection with it, being promoted to the local office some years ago.

George Vaux, who in his earlier years was secretary and treasurer of the Swatara Coal Co. which carried on extensive operations in the Lykens Valley regions prio: to the sale of its coal lands to the Philadelphia & Reading Coal & Iron Co., recently died at Bryn Mawr at the age of 83 years. Mr. Vaux was recognized as the highest authority on the history of the Society of Friends in and near Philadelphia.

Alexander Law, mine foreman for the Pennsylvania Coal Co. at the No. 8 Colliery, died suddenly, Apr. 22, at his residence in Pittston, Penn. He was the son of William Law, one of the pioneer mine superintendents in the anthracite coal field. Either heart failure or the bursting of a blood vessel is believed to have been the cause of his sudden death. Mr. Law is survived by his wife and three children, also three sisters and one brother.

INDUSTRIAL NEWS

Cincinnati, Ohio—Goodin, Reid & Co. recently purchased the entire plant and has the exclusive use of the patent rights of the American Rubberfelt Co. of Chicago. It is operating the plant in Cincinnati.

New York, N. Y.—M. N. MacLaren, New York manager of the Nordberg Mfg. Co., of Milwaukee, Wis., announces the removal on Apr. 26, 1915, of the New York Office from 42 Broadway to offices in the new Equitable Bldg., 120 Broadway.

Columbus, Ohio—The general offices of the Toledo & Ohio Central and the Kanawha & Michigan railroads have been moved from Toledo, Ohio, and Charleston, W. Va., respectively, to the New York Central Building on East Gay St., Columbus.

Washington, D. C.—Assistant Secretary of the Treasury Newton on Apr. 21 awarded the contract for the mechanical equipment for the Laboratory Building of the Bureau of Mines at Pittsburgh, to the Standard Engineering Co. of that city. The contract was for $63,650.

Charleston, W. Va.—Just half as many corporations doing business in West Virginia were dissolved or surrendered their charters as were newly incorporated during the month of March. Sixty-six new charters were issued during March, 55 to resident and 11 to non-resident companies. Thirty-three withdrew from the state by one process or another. Twelve corporations increased their capital stock and 14 decreased it.

Bluefield, W. Va.—Eight large electric locomotives have been placed in service on the Norfolk & Western Ry. to be used in handling heavy coal trains over Bluestone mountain. The motors displace about 40 steam locomotives formerly used for this work, and thus accomplish a considerable economy. Preparations are now under way for the complete electrification of the division, in order to enable coal traffic to be handled exclusively by these large motors.

Charlestown, W. Va.—The shipments of coal and coke over the lines of the Chesapeake & Ohio Ry., during the month of February, and for the first two months of the year, show that 1,404,177 tons were shipped during February as compared with 1,187,833 tons during the same months of 1914. This is an increase of 216,344 tons. During the first two months of the year a total of 3,106,224 tons were shipped as against 2,867,284 tons during the corresponding period of the previous year. This is an increase of 238,940 tons.

Fairmont, W. Va.—The Consolidation Coal Co. recently let a contract for the sinking of two shafts in the Helen's Run field. One will be sunk by the Dravo Contracting Co. of Pittsburgh, and the other by H. S. Stark of Greensburg, Penn. The shafts will be 520 ft. in depth and will cost $50,000 each. They will have an annual capacity of 750,000 tons. The contractors will start work immediately. Western Maryland R.R. Co. engineers are surveying for the new railroad to market the coal from these shafts.

Buffalo, N. Y.—The Buffalo shipping trestle of the Delaware, Lackawanna & Western R.R., which had been ordered closed by the government as an obstruction to navigation, was lately taken entirely out of the possession of the company. A third order has now been issued, permitting its use till a new shipping station can be built, when the present trestle will be removed and the mouth of Buffalo River widened 60 ft. at that point. It is expected that the company will build a car dump on the new water frontage of the yard.

Cincinnati, Ohio—A. A. Kramer, attorney for the Marmet Coal Co. of W. Va., now in the hands of receivers, recently confirmed the report of a sale of the $2,000,000 West Virginia and Ohio coal properties and steamboats of the Marmet Co. to a $35,000,000 Eastern coal syndicate, subject to the confirmation of the courts of West Virginia and of Cincinnati. The new owners intend mining operations on large proportions, also marketing the product of additional West Virginia mines, particularly in Central and Northwestern territory.

Cincinnati, Ohio—A course of six lectures, for the especial benefit of engineers, and firemen at industrial plants, and all others interested, is announced by the University of Cincinnati, to be extended over a period of some months. These lectures deal with proper methods of firing stationary boilers. The course was decided upon after conference with a committee of local stationary engineers. Analysis of coal, the theory of combustion, losses in boiler plants due to improper firing, various types of furnaces in use, and other subjects of practical value will be dealt with in the course.

Charleston, W. Va.—The statement of the shipments of coal and coke over the lines of the Norfolk & Western R.R., during the month of March, and for the first three months of the year, shows a decrease as compared with the shipping during the same period of last year. During the month of March 1,975,876 tons were shipped, as compared with 2,215,188 tons in the same month of 1914. This is a decrease of 239,312 tons. For the first three months of the year, a total of 5,622,635 tons were shipped as compared with 6,062,091 tons during the corresponding period of the previous year, or a decrease of 439,356 tons.

Birmingham, Ala.—The changes in the organization of the Woodward Iron Co., which were unofficially announced and promptly denied a few weeks ago, were recently effected in New York. The position of chairman of the board was created and A. H. Woodward was elected chairman from the position of vice-president and general manager. J. H. Woodward retains the position of president, while the under-official takes the chairmanship. R. H. Bannister was made vice-president to succeed A. H. Woodward. D. E. Wilson was elected treasurer, and Herbert Smith, assistant secretary. The office of secretary is unfilled.

Toledo, Ohio—The Cincinnati, Hamilton & Dayton R.R. recently gave its new docks and coal hoisting machine its first tryout, in loading the steamer "John P. Reiss" with coal for up-Lake shipment. The new machine is one of the largest on the Lake and one of three now in use, the others being at Sandusky and Cleveland. Its capacity is forty 75-ton cars, or forty-seven 50-ton cars of coal per hour. The height of the machine is 90 ft. and its length 60 ft. 1 in. Contractors began the removal of the old coal-hoisting machine on Nov. 28, 1914, and the new dock was completed and the new machine installed and ready for use on Apr. 15. The improvements cost $350,000.

Coal Trade Reviews

General Review

April anthracite business fair but lacking the usual snap that marks the opening period. Bituminous situation mixed. Heavy increase in export business. Adverse outlook in the Lake trade.

The April business in anthracite has been fairly satisfactory, and the month has closed with a good many orders still unfilled. While the circular has been generally well maintained, prices are not very strong, and the April market was notably lacking in the customary snap and rush that characterizes the lowest price period of the year. An extraordinary heavy tonnage of Lake coal has started for the Northwest since the opening of navigation, due to heavy loading on vessels through the winter. Though agencies are not granting direct concessions on circular prices, they are occasionally holding forth inducements in the shape of long-term credits. The indications point to a slowing up in hard coal before the current month is out.

The Eastern bituminous situation continues decidedly mixed. There has been no well defined turn for the better, though inquiries seem more plentiful, and most agencies express more satisfaction with the outlook, but there are others that are of the opinion that the best that can be anticipaed is a mild spurt in the fall which cannot possibly be of sufficient proportion to compensate for the extremely dull year.

One of the most hopeful features at the moment has been the rapid broadening out of the export market, and there are conservative observers who believe that we are on the verge of a tremendous expansion in this trade. Accumulations at a number of the Tidewater ports are substantially reduced, and the movement at some points may establish new high records. Another sharp advance in ocean freights may prove a restraining influence in the export market, but it has developed that many British vessels on this side are not returning to home ports because of the fear of being requisitioned for Government service, and this should help the situation some.

Demand in the Pittsburgh district is slightly better, some of the steel manufacturers taking practically full requirements, but supplies continue excessive, and prices have not recovered. Conservative interests will not admit of any improvements while prices continue so low and the demand light. The beginning of iron ore shipments down the Lakes only serves to emphasize the adverse conditions prevailing in the Lake trade; in fact, it now seems possible that many of the Upper Lakes companies will find their supplies adequate without placing any more orders. Ohio consumers continue purchasing in the open market, and while the opening of navigation has stimulated interest to some extent, the situation is still generally discouraging.

The Middlewestern market is well sustained, considering the general dullness. The agencies are concentrating their efforts on maintaining prices, and an improvement in the demand is anticipated shortly. A few important contracts are being signed up, but at rather low figures. Interest for the time being is centered on slack coal, which is generally in short supply in all directions. Mine operations are down to the summer basis, some mines having been closed down entirely.

BUSINESS OPINIONS

Financial Chronicle—Never was there greater need for care and caution and for the exercise of wholesome restraint. A rising stock market and speculative fervor do not call for the application of repressive measures if sound sense and reasoning can be adduced in support of the same. Within such limits, advancing stock prices mean a revival of hope, and this, in turn, means a revival of energy throughout the length and breadth of the land.

Dun's—The developments of the week have served to strengthen the influences working for improvement, and business confidence further increases. The volume of trade is expanding, although the movement, taken as a whole, is not rapid, and wide differences exist, some industries working overtime, largely by reason of big war orders, others reaching a fairly normal capacity, while others still struggle with adverse conditions. Excellent reports come from the dry goods markets, in which increasing confidence and expansion are noted.

Bradstreet's—Trade continues to expand, progress is of a cumulative character, and even concededly slow lines are evincing a more lively disposition. In fact, the general situation, trade and industrial, seems to be moving on to new and higher ground. Faith in the future is more firmly rooted, and though buying of merchandise is devoid of speculative aspects, the tendency to cover distant prospective wants is rather marked, with sellers in certain textile lines assuming an independent attitude. Reports as to growing crops are flattering.

Boston News Bureau—Every day sentiment the country over shows signs of betterment. Merchants who have benefited comparatively little by the war begin to see an increased demand for their special goods. There is more disposition to do business and this comes from a gradual but steady return of confidence. Big profits have been corralled on war orders. Enormous money has been made in stock specialties. The higher security values make people generally feel better. There is, therefore, less disposition to economize.

The Iron and Steel Industry—The rapid increase in the earnings of the United States Steel Corporation reflects a greater volume of business and profits more important than the small total of $12,500,000, reported for the first quarter, would indicate, even though this is an increase of $1,500,000 as compared with the previous quarter. Pig iron buying has dwindled off, but Southern furnaces sold 35,000 tons during the week; it was estimated that in the first 22 days of April at least 350,000 tons of merchant iron were sold, which is not up to the record of March business. The operation of works is better, having been increased about 4% during the week. Some disappointment was evidenced that the Pennsylvania order for equipment was not followed up by other roads. Rail-making mills hope for better business, particularly foreign. British mills are absolutely out of the market, and colonial mills are taking all the business that is offered, of which there is a fair amount.

ATLANTIC SEABOARD

BOSTON

Spot market dull and deliveries on contract sag off. Buyers still keep out of the market. Export trade may have favorable effect on coastwise situation. Foreign steamers making heavy draft on Georges Creek. Pennsylvania grades listless. Anthracite demand holds on.

Bituminous—There is practically no spot demand for Pocahontas and New River, either here or at the loading ports. Small concessions are heard occasionally but lately no new business of any consequence has developed. Contract requirements are rather less than a month ago, but it is felt that the demand from New England mills must improve soon, with the better conditions that are being predicted for textiles. At present writing, however, manufacturers are holding off, both those who have yet to buy and those who have contracted.

Sales agents are despairing of any marked increase in the volume of business for some months to come. New England is usually about the last section to be hit by any wave of prosperity and unless there is a spurt in the fall, 1915 will be charged off as another extremely dull year.

At the same time, the export market is recognized as having possibilities. The recent order of the Italian Railways for more than 300,000 tons leads some of the shippers to believe we are only at the threshold of a broad foreign demand that will lift the coastwise market out of the doldrums.

The Georges Creek shippers, by reason of their limited output, are commonly the first to feel such a development. So many steamers are waiting now at Baltimore ports that for the present coal from that field is being routed exclusively to those piers. When barges now here and en route are

disposed of it is likely there will be a fortnight or more when receipts of Georges Creek will be extremely light.

Cambria and Somerset coals show the same listlessness that has been characteristic the last month or so. Anthracite barges are gradually being released to the bituminous trade but the demand is not in any way improved. One cargo of Pennsylvania coal has been on the market here for nearly three weeks.

Water Freight are a trifle easier, 75c. having been named this week for barges, Hampton Roads to Boston. On Long Island Sound rates are up 5c. on account of an extra demand for anthracite at the April circular.

Anthracite—The demand for late April loading continued strong to the end of the month. Most of the companies are carrying over a fair supply of orders for May shipment. All sizes are easy at the piers although egg is occasionally reported short.

Current quotations on bituminous at wholesale are about as follows:

	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*	$0.85@1.40	$1.15@1.60	$1.67@1.77	
Philadelphia*	2.10@2.65	2.40@2.85	2.92@3.02	
New York*	2.40@2.95	2.70@3.15	3.22@3.32	
Baltimore*	.....	.....	2.85@2.95	
Hampton Roads*	.....	.....	.....	$2.65@2.80
Boston†	.....	.....	.....	3.55@3.73
Providence†	.....	.....	.....	3.53@3.73

* F.o.b. †On cars.

PHILADELPHIA

Anthracite still shows strength. Close of the month finds domestic sizes in good demand. Bituminous lacks tone, with no immediate improvement looked for.

Anthracite—The closing week of the month finds the operators well supplied with orders for the domestic sizes. Chestnut has fallen off somewhat, but it is understood that the surplus was very easily taken care of in other directions. The Lake season will soon be in full sway, and surplus sizes can be well taken care of, for the present at least. Broken still maintains a good lead and egg and stove are about the same as last week. Pea coal seems to be moving well, but the exceedingly low price prevailing has doubtless caused many dealers to lay in supplies now, who probably would have waited until the fall to take on their supplies of this size; $2 is now the general price prevailing at the mines, with the tax added, and in some cases absorbed.

Prices at Tidewater, closing week of the month:

	Circular	Individuals
Broken	$4.25	$4.25@4.35
Egg	4.50	4.50
Stove	4.50	4.50
Chestnut	4.75	4.65@4.75

Bituminous—There is practically no change in the bituminous situation. Georges Creek coals seem to be somewhat short of the market, but little delay is experienced in having orders filled. All the coal standing at Tidewater has been sent there for orders already in hand, and little spot coal is available.

NEW YORK

Bituminous quiet but trade is optimistic. Better outlook on prices. Current business in anthracite continues active but the outlook is uncertain.

Bituminous—While there is apparently little if any change in the bituminous market, wholesale dealers are optimistic. Business indications are encouraging and the prospects are considered bright for a fair summer. Shippers of the best grades are not over-stocked but are able to meet all immediate demands. Inquiries from manufacturers are on the increase. Some operators who held off closing contracts for the major portion of their output at the low prices which prevailed a couple of months ago are now looking forward to obtaining better figures, in view of the larger number of inquiries being received. Shipments to New England have increased considerably.

The export business is gradually picking up and the prospects are encouraging. Bunkering trade remains fair. Operations continue on about a half-time basis, owners apparently preferring to curtail production rather than see a further cut in prices.

Quotations run about as follows: West Virginia steam, $2.35@2.55; fair grades, Pennsylvania, $2.55@2.65; good grades of Pennsylvania, $2.70@2.80; best Miller Pennsylvania, $3.05@3.10; Georges Creek, $3.15.

Anthracite—The April business continues satisfactory. Prepared coals are moving well. Shippers report sufficient orders on hand to carry operators well into the next month but they are not making predictions as to what might follow. The mines are operating practically full time and production for the month will compare favorably with the April tonnage figures in previous years. There is some cutting of the circular but reports have it that individuals in order to maintain prices are granting longer credits. Lake shipments have opened and this will provide a new outlet which will prove a big help for the mine owners.

Steam coals, particularly the better grades of buckwheat, are in good demand. Nos. 2 and 3 in the better grades are practically out of the market; full circular is being obtained for these coals in the better qualities. There is plenty of the poorer grades to be had. Pea coal is very weak, the prevailing quotation being around $3.40.

The anthracite market is now quotable on the following basis:

	Upper Ports		Lower Ports	
	Circular	Individual	Circular	Individual
Broken	$4.70	$4.70	$4.65	$4.65
Egg	4.95	4.85@4.95	4.90	4.80@4.90
Stove	4.95	4.85@4.95	4.90	4.80@4.90
Chestnut	5.20	5.10@5.20	5.15	5.05@5.15
Pea	3.45@3.55	3.30@3.55	3.40@3.50	3.25@3.50
Buckwheat	2.55@2.80	2.35@2.80	2.50@2.75	2.35@2.75
Rice	2.05@2.30	2.05@2.30	2.00@2.25	2.00@2.25
Barley	1.80	1.55@1.95	1.75@2.00	1.50@1.90

BALTIMORE

Export movement continues to expand and April shipments will break all port records. Bituminous coals in a little better demand. Gas fuels quiet.

The immense amount of coal now being shipped out of this port on foreign contracts is the feature of this market. Unwillingness of British bottoms to go to home ports for fear of being taken over by the government is diverting much South American and Mediterranean business from England to us. That the month of April will see a total movement of 160,000 tons, or 30,000 tons in excess of the previous high record, seems assured.

Except for slack, which is strong, due to the light production, the gas-coal situation is still weak. The prospect of a light call from the Northwest because of heavy stocks still carried there prevented any upward move. Slack sold at from 70 to 75c., practically on a par with run-of-mine. Three-quarter brought around 80 and 85c.

HAMPTON ROADS

Heavy movement of export coal on both steam and sail vessels. Indications are for large dumpings in April.

The export movement of coal from Hampton seems to be increasing weekly and present indications are that the shipments both coastwise and foreign were heavy over the month end. Italy has taken a large share of the business moving. A fair estimate of the quantity shipped to the various Italian ports would be approximately 45,000 tons.

The accumulation of coal at Tidewater is perhaps lower than for months and with the amount of vessel tonnage now in port and that due the indications are that this will be reduced considerably below normal supply even with that now en route being rushed forward.

The movement is confined almost entirely to Pocahontas and New River mine-run, although it is expected there will be some shipments of the prepared coals soon. There has been no change in prices at the Hampton Roads ports and sales are close to the regular circular prices.

Bunker takings are still holding up well, vessels arriving during the week taking from 300 to 1200 tons according to the size of the steamer and her destination. The largest supply of bunkers taken by any one vessel went into the Argentine battleship "Moreno" which was supplied from barges at Newport News. This vessel took about 4000 tons.

The following steamers have sailed with cargoes of coal:

Norfolk		
Vessel	Tons	Destination
G. M. Embiricos[1]	5746	Piraeus
Emily I. White	512	Santo Domingo
Elvaston[2]	6008	Montevideo
Three Marys[2]	1569	Bermuda
Genova[3]	5632	Genoa
Atlantide[3]	7051	Porto Ferrajo
Pacific[4]	6946	La Plata
Doris[3]	4768	Leghorn
Josef Frederik[5]	2767	St. Thomas
Itasca[3]	1033	Bermuda
Tottenham[2]	4500	St. Lucia
Breyton[6]	6344	B. Aires
Josephine[1]	1184	Pernambuco
C. A. Campbell[1]	2010	Para
O. C. Curtis[1]	3209	Rio de Janeiro
Edith S. Cum's[1]	926	Maranhao
Adriatico[3]	6025	Messina
Harwood[2]	5900	Montevideo
Alden[2]	5050	Montevideo
Franham[2]	4100	Montevideo
Mark Pend'ton[3]	734	Horta, Azores
Uranus[3]	4601	Italy
St. Kilda[4] ab.	6100	B. Aires
M. F. Barrett[1]	3100	Rio de Janeiro

Newport News	
Vessel	Destination
Berwindmoor[7]	Taranto, Italy
Frankby[7]	Taranto, Italy
Llandberis[8]	Rio de Janeiro
Competitor[8]	Rio de Janeiro
Atlas[8]	Montevideo

Shippers—[1] Smokeless Fuel Co. [2] Castner, Curran & Bullitt. [3] Pocahontas Fuel Co. [4] Virginia Coaling Corp. [5] Hasler Bros. [6] W. C. Atwater & Co. [7] Berwind-White Coal Mining Co. [8] Chesapeake & Ohio Coal Agency.

Virginian Ry.—Dumpings of this road at Hampton Roads for the week ended Apr. 24 amounted to 178,738 tons.

OCEAN FREIGHTS

Further advance in vessel rates. Fewer steamers available. Grain shippers quoting higher figures for September loading.

Freight market conditions changed very materially during the last week and rates are again advancing. A number of steamers have been chartered for export coal since last report at or about rates quoted below, and the number of available steamers has decreased owing to the rapid absorption of tonnage by various trades during the last few days. For September loading, grain shippers are offering higher rates than are current for May loading. Steamers are offered at $10.80 for four trips to the West Coast of Italy; $10.20 to Marseilles or Algiers; and $9.60 to Barcelona or Valencia, and charters have been arranged recently on about these terms. Rates on grain from the Plate have advanced and consequently outward rates on coal are unchanged.

To	Rate	To	Rate
Havana	$2.25@2.50	Guantanamo	$3.00@3.25
Cardenas or Sagua	3.00@3.25	Demerara	5.50@6.00
Cienfuegos	3.25@3.50	Bermuda	3.50@3.75
Port au Spain, Trinidad	3.75@4.00	Vera Cruz	3.50
St. Lucia	3.50@3.75	Tampico	3.50
St. Thomas	3.25	Rio	9.36
Barbados	3.75@4.00	Montevideo	9.12
Kingston	3.00@3.25	Buenos Aires or La Plata	9.25
Curacao	3.75@4.00	Mediterranean*	10.80@11.40
Santiago	3.00@3.25	Valparaiso†	8.40@ 9.00

Note—Rates noted in **bold face** type are only approximate.
* To a direct port not east of the West coast of Italy, Spain excluded.
† With 800 tons per day discharge.
W. W. Battie & Co.'s Coal Trade Freight Report.

OCEAN CHARTERS

Coal charters have been reported by the "Journal of Commerce" as follows:

Vessel	Nationality	From	To	Tons	Rate
Rosalie	British	Baltimore	Buenos Ayres	2725	$9.36
Charles Davenport		Philadelphia	Portland	1157	
Annie B. Mitchell		Philadelphia	Camden, Me.	397	1.00
Ellaline	British	Baltimore	River Plate	2491	9.12
Christoforos	Greek	Atlantic Range	Barcelona,[1]	2345	10.12
——hall	British	Virginia	Rio Janeiro		9.60
Winnfield	British	Baltimore	River Plate	2205	9.36
Egda	Norwegian	Philadelphia	Antilla	1610	
Thorsa	Norwegian	Philadelphia	Manzanillo	683	
Stella del Mare (bark)	Italian	Baltimore	Italy[2]	1026	
Florence Howard		Baltimore	Mayport	683	1 00
William Bisbee		Philadelphia	Swan Island, Me	206	1.50
Charles H. Klinck		Philadelphia	Kittery, Me.	444	1.00

[1] Valencia or Algiers. [2] West Coast.

Note—Steamers are indicated by **bold face type**, all others being schooners.

LAKE MARKETS

PITTSBURGH

Market still demoralized, with mines operating at about 50% and very little Lake coal moving. Lake Superior iron ore market opened.

The opening of the Lake Superior iron ore market last week emphasizes the backwardness of the Lake coal trade. Ore shipments are being made in small quantities and the way in which ore has sold since the opening is held to indicate that by the middle of May there will be a fair movement down the Lakes, but the coal movement seems still far in the future. While Lake coal is being moved the tonnages are almost inconsequential and there has been scarcely any buying for the season, it being a question thus far whether the regular supplies of shippers may not prove practically equal to the demand in the Northwest.

Demand for coal from manufacturers has increased slightly, and some consumers in the steel trade are taking practically their normal tonnages under long-term contracts. The spot demand continues light and the supplies are excessive, so that prices have not recovered from their demoralization. Contract prices for the twelvemonth are supposed to be based on about $1.15 for mine-run, but hardly anything is being done.

Prices for free coal we quote the same as the reduced figures given last week, but even these prices are sometimes shaded: Slack, 75@80c.; nut and slack, 90@95c.; nut, 95c.@$1; mine-run, $1@1.05; ¾-in., $1.10@1.15; 1¼-in., $1.20@1.25, per net ton at mine, Pittsburgh district. Lake coal is reputed to be $1.15 to consumers and $1.10 to dealers but it is not firm, at these figures. Mine operations continue at about 50% of capacity.

BUFFALO

Some improvement here and there, but prices generally slack and lower than a year ago. Demand expected to improve slowly. Heavy movement of anthracite up the Lakes.

Bituminous—There is a somewhat better feeling in the trade in general, though conservative interests are slow to admit it, giving as a proof of their position that prices are still slack and many shippers are making contracts at less than last year's figures. The industrial situation is improving, with at least some promise of a return to the normal before long, and when this occurs the price of bituminous coal must advance. But there is no doubt that sellers are discouraged, offering prices 5 to 15c. lower than last year, rather than be driven out of the market entirely. At no time in this long period of depression has the seller been in such an uncertain position. It appears that the worst of the depression is over, though improvement is likely to be slow and it may find a good many shippers tied up with burdensome contracts.

This is the season for rearranging price quotations. In view of the contract prices made during the present month, leading shippers agree that maximum figures may now be placed at $2.70 for best Pittsburgh lump, $2.55 for threequarter, $2.45 for mine-run, $2.10 for slack and $2.50 for smokeless.

Anthracite—The demand is normal and there is no complaint heard from the shippers. Retailers do not think the year has done much for them, though the Buffalo city trade has been held together well.

Shipments by Lake have begun, a large fleet sailing last week. The amount cleared to date is 178,000 tons, nearly all of it to leading ports at the head of the Lakes. This large tonnage is due to the heavy winter loading of one company. In all, the list was over 30 cargoes, aggregating close to 250,000 tons. The vessels do not find much down freight and so are not anxious to leave.

TORONTO, CAN.

Demand for both domestic and steam coal light. Stocks generally large.

The demand for domestic coal is light, consumers buying from hand to mouth. The market for steam coal is also quiet, as most factories are still running considerably below capacity, with little prospect of any improvement for some time. Dealers have ample supplies on hand in all lines. Quotations for best grades are as follows: Retail, anthracite, egg, stove and nut, $8; grate, $7.75; pea, $6.75. Bituminous steam, $5.25; screenings, $4.25 to $4.50; domestic lump, $6; cannel, $7.50; wholesale f.o.b. cars threequarter lump, $3.56; screenings, $2.90.

COLUMBUS

Slight stir in the Lake trade. Domestic business dull. Steam trade is not increasing to any extent.

The best feature of the Ohio market during the past week was a slight activity in the Lake trade. The season was officially opened Apr. 15 and a small amount of coal was loaded for shipment to the Northwest; a few cargoes have already moved. The tonnage, however, is not as large as formerly because of the excessive amount carried over on the docks of the Upper Lake Ports. Chartering of boats is not active and many companies have not yet started their Lake business in any way. Lake prices will be the same as last season. One of the best features is a slight stir in the ore trade which is expected to cause a better movement of boats.

Domestic trade has been dull in every way. Dealers have not been buying except when absolutely necessary to piece out the season. In some sections retailers' stocks are fairly heavy but generally speaking they will have little to carry over. Buying for early stocking is limited to anthracite and Pocahontas. Some West Virginia splints are also in demand. Hocking lump is not moving as it is never stocked this early in the year. Retail prices are still fairly well maintained although summer levels are not far off.

Production in Ohio fields has not increased materially during the past week. Despite the small amount loaded for Lake shipment the Hocking Valley has only produced about 30% of normal and the same figures are reported from Massillon, Cambridge, Crooksville and Jackson. In the Pomeroy Bend district the output is estimated at about 50% of the average.

The only strong point in the market is the demand for the small sizes which are still scarce. This is due largely to the curtailed production of lump. Anthracite business is fairly active for this period of the year.

Prices in the Ohio fields are:

	Hocking Valley	Pomeroy	Kanawha
Rescreened lump	$1.45	$1.50	..:..
Inch and a quarter	1.30	1.35	$1.30
Three-quarter inch	1.25	1.30	1.25
Nut	1.15	1.25	1.15
Mine-run	1.05	1.10	1.05
Nut, pea and slack	0.75	0.75	0.70
Coarse slack	0.65	0.65	0.60

CLEVELAND

The market has no absorbing power and prices are barely holding. Manufacturing companies are buying on the open market in preference to contracting.

Receipts of coal have been light, but Pan Handle, Youghiogheny, Fairmont and West Virginia No. 8 coals sold at low prices on the spot market, often for less than jobbers are paying for shipment. Pan Handle slack sold Monday at $1.65 to $1.70 Youghiogheny at $1.65 to $1.75, Fairmont at $1.65 to $1.75 Richland three-quarter at $1.80 to $1.85 and mine-run 5c. a ton lower. This coal from across the line in West Virginia is the same as Ohio No. 8.

The Lake trade is opening slowly. W. A. Pugh, of Racine, Wis., was here Monday and contracted for vessels to transport 50,000 tons of soft coal at 40c. a ton. Most of the Lake shippers are sending a few cargoes up the Lakes, but, will not ship very heavily after the first cargoes are delivered. It is not expected Lake shipping of coal will reach a large volume before June.

Iron ore prices have been established on the same basis as last year. The prices are very low and Lake freight rates will not be any higher than in 1914. Sales last week were very large considering business conditions and ore shipments will be in excess of last year.

Quotations on coal for shipment are:

	Pocahontas	Youghiogheny	Bergholz	Fairmont	W. Va. No. 8
Lump	$3.10	.....	$2.00	$1.90@1.95	$1.80@1.90
Lump, 1 in	.....	$2.20@2.25	.....	.....	.....
Egg	3.10	.....	.....	.....	.....
Mine run	2.65@2.70	2.10	1.90	1.85@1.90	1.75@1.85
Slack	.....	1.70@1.75	1.70@1.75	1.70@1.75	.....

LOUISVILLE, KY.

Market restricted to stocking and industrial demand. Mine operations slightly stronger.

The market is now on a stocking or industrial basis, there being practically no demand of any other description. The industrial consumption is improving steadily and a generous rain over the state has been of much service in restoring confidence. Stocking orders are more plentiful and operations at the mines are on the increase. Prices continue as for the last several weeks with no changes of importance.

COKE

CONNELLSVILLE

Firmer tone sentimentally but little activity and no better prices. Production and shipments increased.

Sentimentally, the coke trade has improved further, but the merchant coke market obtains no increased strength from within. There has been a constant increase in production by the producer-consumer class, which absorbs more labor and with a little further employment, the coke operators who reduced wages last year will have to restore rates to the higher level still paid by many interests, including the Frick Company. The merchant pig-iron market is nominally on a better plane, through the opening of the Lake Superior ore market last week, with a fair volume of sales, and the buying of over 60,000 tons of pig iron by the Youngstown Sheet & Tube Co. There are fair stocks of pig iron and there is not much disposition manifested towards the blowing in of idle merchant furnaces.

Coke prices are quotable as formerly but a little additional buying would probably send them up, there being little more coke available at these figures: Prompt furnace, $1.55@1.60; contract furnace to June 30, $1.60@1.65; contract furnace to Dec. 31, $1.75; prompt foundry, $2@2.35; contract foundry, $2.20@2.30, per net ton at ovens.

The "Courier" reports production in the Connellsville and lower Connellsville region in the week ended Apr. 17 at 298,222 tons, an increase of 6007 tons, and shipments at 294,995 tons, an increase of 7166 tons.

Buffalo—There is little more coke moving, but the increase is not enough to make any real difference in the trade and prices remain as before. It will require a decided increase in volume to affect prices, which have long been at what was regarded as the bottom. Quotations remain at $4.15 for best 72-hr. Connellsville foundry, with stock coke $3.30.

Chicago—Some inquiries are being put out by large consumers for prices under contract for foundry use. The market this week has been quiet but firm, and little domestic business is reported. Quotations are as follows: Byproduct, $4.45@4.65; Connellsville, $4.60@4.75; Wise County, $4.50@4.65; gas coke, $3.75@4; furnace, $4.50@4.65.

MIDDLE WESTERN

GENERAL REVIEW

Dullness still prevails but signs of improvement are appearing. Screenings firmer. More activity in anthracite.

The market still continues extremely dull, but prices are generally well sustained, considering the depression. Shippers who have feared that prices would slump, because of impatience to make sales under present conditions, find their anticipations not realized. Everybody seems to be of one mind to maintain prices in the face of a paucity of orders. It is now realized forcibly that cutting prices does not create additional orders. A distinct impression prevails that things are slowly changing for the better.

The demand for steam coals is still at a low ebb, but shippers think the outlook better than for some time past. Increased inquiries are being received for future deliveries. Slow progress is still noted in contract making. The screenings situation generally shows strength, and the recent slight reaction has been entirely overcome. There is little buying in domestic coals, and the retailers are placing practically no orders, although in some cases their stocks are very moderate.

CHICAGO

Mine operations much curtailed and a number closed for the summer. Screenings active.

The Indiana mines are operating about two days per week on the average, and several additional mines have been closed down this week for the summer months. It is said that less foreign coals are being sold at the present time in the Indiana territory than last year. The operators are about to inaugurate a campaign for the consumption of home coal by state and municipal institutions which in times past largely bought coal from mines in other states. The demand for screenings is better, and prices are averaging 5c. per ton higher than last week.

The Springfield operators are closing down their mines rather than sell coal below cost of production. This has naturally decreased the output of screenings and caused the price to advance about 10c. per ton.

There is little change in the Franklin and Williamson County situation, and prices are well maintained in the face of light production. The demand is more noticeable for washed sizes for steam purposes than anything else.

The smokeless market is hesitating. There is no demand for what little coal is on track here, and the operators' representatives are not making much headway in placing contracts. Slightly better demand is said to be shown for the coarse sizes.

Anthracite shipments have increased over last week, although it can be said that the yards are not showing any great tendency to stock up at present quotations.

Prevailing quotations are as follows:

	Williamson and Franklin Cos.	Springfield	Sullivan	Clinton	Carterville
Lump	$1.25@1.35	$1.35	$1.35@1.50	$1.25@1.45	$1.45@1.65
4-in. lump	....	....	....	....	....
Steam lump	1.20@1.35	1.15@1.25	1.25@1.35	1.20@1.30	....
2½-in. lump	....	....	....	....	....
1¼-in. lump	....	....	1.25@1.40	1.15@1.30	....
Mine-run	....	1.00@1.05	1.05@1.15	1.00@1.10	....
Egg	1.20@1.35	1.35	1.30@1.45	1.15@1.35	....
No. 1 washed	1.25@1.35	....	1.75	....	1.40@1.65
No. 2 washed	1.25@1.35	....	1.65	....	1.40@1.50
6x3-in. egg	....	....	....	....	1.50@1.65
Nut	....	1.25	1.15@1.35	1.10@1.20	....
No. 1 nut	1.25@1.35	....	....	....	....
No. 2 nut	1.25@1.35	....	....	....	....
No. 4 nut	1.10@1.15	....	....	....	....
Screenings	0.75@0.90	0.80@0.85	0.80@0.95	0.75@0.85	0.90

	Saline Co.	E. Kentucky	N. Riv. & Poca.	Somerset	Hocking
Lump	$1.20@1.35	$1.35@1.40	$1.50@1.60	$1.50	....
1¼-in. lump	1.20@1.25	1.35@1.40	....	....	$1.40@1.50
Mine-run	1.10	....	1.10	1.10@1.15	1.10@1.15
Egg	....	1.00@1.10	1.50@1.60	1.35@1.50	....
No. 1 nut	1.25@1.40	....	1.35@1.40	....	....
No. 2 nut	1.20@1.35	....	....	....	....
Screenings	0.85@0.90	....	....	....	....

Greene County 5-in. lump, $1.25; 3-in. lump, $1.15; 5-in. egg, $1.15; 3-in. egg, $1.10@1.15; mine-run, $1@1.95. Screenings, 70 to 80c.

ST. LOUIS

Some contracts closed with figures generally low. Market dull except on screenings, which are active.

A few inquiries for contract coal seem to be the only life of the local market. During the past week the Frisco R.R. fuel contracts were let, and a few other minor contracts were also awarded. Prices were below what was anticipated in a general way, which would seem to indicate that the

operators are not figuring on a prolonged suspension during the spring of 1916.

The domestic market is extremely quiet, there being no demand either from the city or country. Excepting for a fairly heavy movement of screenings, there is nothing unusual in the steam trade. For a few days screenings may be in demand, and again there is apparently an over-production, or the buyers are holding off to force lower prices. The screenings market will continue to be firm for the next month or two at least.

A small tonnage of anthracite is moving in, and that is practically all of the outside fuel that there is any demand for; this is largely for storage purposes. There is no change in circular prices. Carterville screenings being worth about 85c., and Standard screenings 80 to 85c.

INDIANAPOLIS

New retail prices announced. Trade very quiet but a slight improvement is noticeable. Screenings short.

Mining conditions in Indiana have been almost in a rut for a month, the only change being an almost imperceptible improvement in the industrial situation. Coal salesmen say that the improvement is evident, however gradual it may be. Mines over the state seem to be averaging three to four days a week. The demand for slack continues to be the feature of the trade and operators are getting 85 to 95c. for it. Most companies have all they can do to take care of their contract orders on screenings and are not in the open market for this grade. The supply of fine coal depends on the railroad takings of 1¼-in. lump.

The local retailers reduced their prices to the summer level, Apr. 20. The reductions amounted to 50c. a ton on most coals, with 75c. on anthracite and Pocahontas. The new schedule is:

	Per Ton		Per Ton
Linton No. 4, forked	$3.00	Anthracite chestnut	7.75
Indiana lump, forked	2.75	Anthracite stove and egg	7.50
Indiana lump and egg, screened	2.50	Anthracite grate	7.25
Kanawha lump, forked	4.25	Connellsville coke	6.00
Ohio Hocking lump, forked	4.25	Indianapolis byproduct coke	5.50
Ohio Hocking washed egg	4.50		
Kentucky lump	4.50	—Extra Delivery Charge—	
Ohio Jackson lump, forked	5.00	Egg, 50c. a ton extra, ground floor or dumped in cellar.	
Blossburg smithing	5.50	Bags, 75c. a ton extra, carried into cellar.	
Cannel lump	6.00	Charge for chute or wheelbarrow, 25c. a ton.	
Pocahontas forked lump	5.50	Coke, bags 60c. bags in cellar 80c.	
Pocahontas shoveled lump	5.00		
Pocahontas mine run	4.00		
Pocahontas nut and slack	3.50		

KANSAS CITY

Retail business quiet but the wholesale trade is improving.

The wholesale business has been doing a little better but prices, which are at the very lowest figure, have not been affected. However, more factories operating than have been for some time and the agencies expect to have the largest business this season they have had for years. Steam grades are all that have been moving and they have been rather slow.

PORTLAND, ORE.

Demand light and summer prices will soon be in effect unless mine figures are advanced.

Just as the coal dealers were planning on announcing summer quotations, the rumor reached Portland that the mines in Utah are planning an advance in prices. Whether they will become effective or not is a question yet to be answered. On account of the high charter rates it is improbable that any coal will be brought to this city from Australia next fall.

PRODUCTION AND TRANSPORTATION STATISTICS

NORFOLK & WESTERN RY.

The following is a statement of coal handled by the N. & W. Ry. during March and the past four months in short tons:

	December	January	February	March
Pocahontas Field	798,182	912,682	835,826	1,003,437
Tug River District	227,944	298,766	243,910	282,886
Thacker District	227,938	257,580	195,557	227,817
Kenova District	90,030	98,422	67,667	66,605
Clinch Valley District	135,362	169,581	129,193	144,031
Other N. & W. Territory	1,686	3,769	1,785	2,478
Total N. & W. Fields	1,481,142	1,740,800	1,473,938	1,727,254
Williamson & Pond Creek R.R.	62,271	58,296	58,101	48,052
All other railroads	97,752	87,842	88,982	129,446
Grand total	1,641,165	1,886,938	1,621,021	1,904,752

Distribution of shipments for March was:

	Shipped	Tipple	Total
Pocahontas	879,237	13,433	892,670
Tug River	281,162	1,261	282,423
Thacker	182,943	7,986	190,929
Kenova	58,867	7,738	66,605
Total	1,402,209	30,418	1,432,627

Shipments of coke entirely from the Pocahontas field, amounted to 57,584 tons.

VIRGINIAN RAILWAY

Shipments over this road for February of the current year amounted to 283,430 short tons as compared with 344,139 during the preceding month.

BITUMINOUS COAL MOVEMENT

The following is a summary of the movement of coal and coke over 13 principal railroads during February and the first two months of the last two years, in short tons:

	February		2 Months	
Anthracite	1914	1915	1914	1915
Baltimore & Ohio[1]	120,789	95,779	258,059	218,856
Chesapeake & Ohio[1]	1,063	962	2,106	1,731
Erie[2]	597,304	600,188	1,388,374	1,246,436
Pennsylvania[1 3]	705,020	771,328	1,620,047	1,665,857
Virginian[2 1]	9	.....	9	98
Total 5 roads	1,424,185	1,468,257	3,268,595	3,132,978
Bituminous				
Baltimore & Ohio[1]	2,517,219	2,026,142	5,614,859	4,464,233
Buffalo, Roch. & P.[1 2]	754,648	579,094	1,571,907	1,174,606
Buffalo & Susq.[1 2]	135,158	102,653	282,739	195,034
Chesapeake & Ohio[1]	1,150,576	1,388,906	2,794,728	3,078,677
Erie[3]	12,127	8,610	22,107	19,866
Hunt. & Br'd T. Mt.[1 2]	97,108	77,761	202 847	165,152
New York Central[3]	738,601	669,048	1,574,059	1,494,809
Norfolk & Western[1 2]	1,666,475	1,621,021	3,632,289	3,507,959
Pennsylvania[1 3]	3,556,665	3,031,069	7,674,179	6,602,414
Pitts. & Lake Erie[1 2]	955,605	566,664	1,786,409	1,144,370
Pitts. Shaw. & North[1 2]	246,810	193,143	534,284	425,315
Virginian[1 2]	259,756	283,430	666,865	627,569
Western Maryland	234,895	251,020	525,897	565,354
Total 13 roads	12,325,643	10,798,561	26,883,169	23,465,358
Coke				
Baltimore & Ohio[1]	265,380	232,111	540,335	453,506
Buffalo, Roch. & P.[1 2]	22,041	31,584	50,821	65,418
Buffalo & Susq.[1 2]	36,202	46,974	69,697	96,748
Chesapeake & Ohio[1]	36,194	14,309	70,450	25,746
Norfolk & Western[1 2]	95,869	68,585	214,614	138,800
Pennsylvania[1 3]	819,486	741,757	1,672,898	1,427,303
Pitts. & Lake Erie[1 2]	415,365	299,952	819,513	578,718
Western Maryland	6,465	699	14,736	4,025
Total 8 roads	1,697,002	1,435,971	3,453,064	2,790,264

Total Coal and Coke 13 Roads	1914	1915
January	18,157,998	15,685,811
February	15,446,830	13,702,789
Total 2 months	33,604,828	29,388,600

[1] Includes coal received from connecting lines.
[2] Includes company's coal.
[3] Does not include company's coal hauled free.

Note:—The Southern Railway hauled 356,663 short tons of bituminous coal during February, 1914, and 286,243 short tons during the two months ending February.

EXPORTS BY DISTRICTS

The following is a statement of exports of coal from the United States by states during February:

Districts	Anthracite	Bituminous	Coke
Maine and New Hampshire	503	40	.....
Maryland	.....	79,029	.....
New York	2,827	1,345	131
Philadelphia	386	32,794	95
Porto Rico	.....	190	.....
Virginia	.....	150,417	979
Mobile	.....	99	.....
New Orleans	.....	339	2
El Paso	.....	15,651	3,151
Arizona	.....	2,056	.....
Laredo	.....	351	
San Francisco	.....	.....	14
Southern California	.....	23	.....
Washington	1	2,961	2,073
Buffalo	112,422	201,125	30,266
Dakota	882	5,814	173
Duluth and Superior	133	5,284	160
Michigan	.....	56,401	5,625
Rochester	2,269	5,174	185
St. Lawrence	58,131	25,293	1,290
Vermont	686	502	165
Total	178,240	584,888	44,369

PENNSYLVANIA RAILROAD

The following is a statement of shipments over the P. R.R. Co.'s lines east of Pittsburgh and Erie for March of the current year and the three months of 1914 and 1915, in short tons:

	March		Three Months	
	1915	1914	1915	1914
Anthracite	814,872	1,086,344	2,480,729	2,706,391
Bituminous	3,243,270	4,740,313	9,845,684	12,414,492
Coke	876,532	1,027,339	2,303,835	2,700,237
Total	4,934,674	6,853,996	14,630,248	17,821,120

FOREIGN MARKETS

GREAT BRITAIN

Apr. 16—Outputs are more satisfactory and the market is hardly so firm. Quotations are approximately as follows:

Best Welsh steam	Nominal	Best Monmouthshires	$8.40@8.52
Best seconds	Nominal	Seconds	7.80@8.04
Seconds	$8.64@8.88	Best Cardiff coals	5.22@5.34
Best dry coals	8.76@9.00	Cargo smalls	4.44@4.68

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both net, exclusive of wharfage.

Freights—Chartering is less active but rates are fully maintained. Rates are approximately as follows:

Gibraltar	$3.84	Naples	$6.00	Las Palmas	$3.84
Marseilles	4.439	Venice	9.60	St. Vincent	4.44
Algiers	4.246	Alexandria	6.36	Rio de Janeiro	6.72
Genoa	6.00	Port Said	6.24	Monte Video	6.24
				River Plate	6.48

Exports—British exports for March and the first three months of past three years were as follows:

	March			Three Months		
To	1913	1914	1915	1913	1914	1915
Russia	111,338	175,134	.....	445,120	552,555	.....
Sweden	281,468	239,201	257,038	887,124	746,078	757,277
Norway	201,410	233,444	296,307	640,918	695,324	692,344
Denmark	252,905	271,695	285,880	783,134	719,769	733,007
Germany	615,008	737,017	.....	1,877,625	1,875,014	.....
Netherlands	166,439	151,146	169,040	555,320	418,192	437,652
Belgium	220,687	140,314	.....	614,674	491,991	.....
France	1,072,300	1,235,041	1,275,725	3,227,793	3,791,450	3,919,763
Portugal[1]	96,136	123,867	117,211	377,472	352,862	299,307
Spain[4]	321,814	319,617	156,388	1,027,019	958,922	539,043
Italy	841,966	736,565	714,993	2,429,048	2,392,315	1,760,022
Aus. Hung.	118,498	63,444	.....	400,085	218,190	.....
Greece	49,598	60,567	47,734	149,835	187,029	111,778
Roumania	4,239	37,991	.....	7,288	46,325	.....
Turkey	7,718	68,340	.....	33,676	171,634	.....
Algeria	112,917	105,528	76,041	375,519	321,854	252,695
Portuguese[6]	16,769	18,927	24,630	77,641	62,976	65,537
Chile	48,076	64,822	3,551	142,943	146,858	12,840
Brazil	206,160	112,893	50,616	496,519	394,219	163,504
Uruguay	53,526	63,287	43,370	182,445	184,112	128,675
Argentine	290,459	330,800	168,567	919,202	1,011,746	537,871
Channel Is.	8,967	16,661	15,194	32,782	41,451	32,295
Gibraltar	42,584	44,964	32,472	105,929	97,313	102,760
Malta	94,005	69,102	6,025	246,249	148,923	28,694
Egypt[3]	183,000	302,725	125,967	740,015	883,004	396,697
Aden[3]	4,978	29,091	.....	32,614	52,651	22,095
India	34,328	18,618	1,620	65,641	40,300	10,910
Ceylon	23,067	21,971	1,505	61,121	86,716	17,131
Miscell'ous.	118,414	116,950	107,399	304,258	340,596	197,829
Coke	76,340	82,898	68,281	282,190	301,749	235,174
Briquettes	156,210	178,100	98,202	507,202	502,181	243,348
Total	5,831,324	6,170,720	4,143,756	18,028,401	18,234,299	11,698,248
Bunker	1,654,142	1,689,304	1,300,467	4,951,231	5,035,448	3,978,631

[1] Includes Azores and Madeira. [3] Including Anglo-Egyptian Sudan. [3] And dependencies. [4] And Canaries. [6] West Africa.

FRANCE

For the first six months of last year the coal imports of France broke all records, although the native production until the outbreak of the war was normal. After Aug. 1 the supply from Germany and Belgium was shut off, so that France had to depend upon Great Britain for its foreign coal, although small quantities were received from the United States. Of the foreign coal reecipts in 1914, Great Britain furnished 10,759,085 tons, as compared with 11,257,228 tons in 1913. The receipts of Belgian and German coal were 2,032,098 and 2,341,996 tons, respectively, against 3,669,395 and 3,490,576 tons, respectively, in 1913. The bulk of the French coke imports in 1914 came from Germany, 883,033 tons, as compared with 2,392,897 tons in 1913.

DIVIDENDS

The following is a partial list of the more important dividends announced since the first of the year:

Burns Bros.—Regular quarterly dividend on the common of 1¼%, payable Feb. 15 to holders of record, Feb. 1, and also regular quarterly on the preferred No. 8 of 1¾%, payable Feb. 1 to holders of record, Jan. 15.

Consolidation Coal—Regular quarterly of 1½%, payable Jan. 30 to holders of record, Jan. 23. The transfer books are not closed for this dividend.

Dominion Coal—Preferred dividend No. 44 of 3½%, payable Feb. 1 to holders of record, Jan. 6.

Maryland Coal of West Virginia—Dividend of 1%, payable Feb. 1 to holders of record, Jan. 22 to Jan. 31 inclusive.

Pacific Coast—Regular quarterly dividend on the common and second preferred of 1%, and on the first preferred of 1¼%, all payable Feb. 1 to holders of record, Jan. 21 to Feb. 1.

Lehigh Coal & Navigation—Regular quarterly dividend of $1, payable Feb. 27 to holders of record Jan. 3.

Jefferson & Clearfield Coal & Iron—Dividend of 1¼% on the preferred, payable Feb. 15 to holders of record, Feb. 9.

American Coal—Dividend of 3%, payable Mar. 1 to holders of record, Feb. 27.

American Coal Products—Regular quarterly dividend of 1¾% on both the common and the preferred, the former payable Apr. 1 to stock of record Mar. 26 to Mar. 30, and the latter payable Apr. 15 to stock of record Apr. 11 to Apr. 14.

Central Coal & Coke—Regular quarterly dividend on the preferred of 1¼%, payable Apr. 15 to stock of record Apr. 1 to Apr. 15.

Temple Coal—Regular quarterly dividend on the preferred of 2%, payable Apr. 12 to holders of record, Apr. 2.

I. C. C. DECISIONS

I. C. C. Nos. 5336, 5336 Sub. No. 1, 5336 Sub. No. 2, 5336 Sub. No. 3, 5358, 5358 Sub. No. 1—McCaa Coal Co., Elliott Splint Coal Co., Gilmer Consolidated Coal Co., Queen Shoals Coal Co., Morris Fork Coal Co., Elk Manor Coal Co., vs. Coal & Coke Ry. Co.

1. Upon a supplemental hearing the coal operators and the defendant railway company submitted a statement showing the mine ratings which shall form the basis for the distribution of coal cars during periods of car shortage. This agreement being satisfactory to all concerned, is accepted by the commission as a compliance with its original findings herein, 30 I. C. C., 531.

2. During periods of car shortage, the allotment due any particular one of the four mining operations controlled by the Davis Colliery Co. shall be used by that particular mine, and should such mine countermand its order for cars on any day, such cars shall revert to the general supply and be distributed among the mines along the line of the defendant railway company according to the respective mine ratings. Rail & River Coal Co. vs. B. & O. R.R. Co., 14 I. C. C., 86, distinguished.

3. Cars which are partially loaded and remain over until the next day to be fully loaded shall be charged against the mine loading the same, as if such cars were empty.

I. C. C. No. 6128, Sub.—No. 1 and Sub.—No. 2—Vulcan Coal & Mining Co., St. Louis—Coulterville Coal Co., Groom Coal Co. vs. Illinois Central R.R. Co.

Complainants request reparation for damages occasioned by the alleged failure of the defendant upon reasonable request to furnish cars for the shipment of coal from complainants' mines; defendant denies the Commission's jurisdiction and argues that the question raised is one for the determination of the courts: **Held:**

1. The question as to the extent to which defendant failed to comply with the duty it owed complainants is an administrative one, of which the Commission alone can take original jurisdiction.

2. It is obvious that the absolute refusal of a carrier to furnish a shipper cars would be a violation requiring no administrative determination and of which the courts could take primary jurisdiction.

3. Considerations of expediency should have no weight in deciding whether or not the Commission should assume jurisdiction.

4. Reference made to cases dealing with the question of priority of jurisdiction as between the Commission and the courts.

5. The assumption of jurisdiction in the present case is not inconsistent with the mandamus provisions of section 23 of the act. B. & O. R.R. Co. vs. Pitcairn Coal Co., 215 U. S., 481.

6. Defendant is not deprived of its rights under the seventh amendment to the Constitution.

7. A carrier must do more than provide itself with sufficient equipment for the slack period of coal production.

8. A carrier must assume the burden of explaining or excusing its failure to furnish cars.

9. The question of whether or not the car supply was reasonably adequate at these particular mines and the question of the amount of damages, if any, left for a subsequent hearing.

Coal Contracts Pending

The purpose of this department is to diffuse accurate information of prospective purchases and prices with a view to affording equal opportunity to all, promoting market stability and inculcating sound business principles in the coal trade.

✚Indicates contracts regarding which official information has been received.

Recast

In the following table we give a list of all old contracts coming up for consideration during the ensuing week. The table gives our contract number, the name of the purchaser, city, tonnage and page on which the detail notice appeared.

No.	Purchaser	City	State	Tonnage	Page
+465	Board of Education	St. Louis	Mo.	30,000b	627
+465	Board of Education	St. Louis	Mo.	700a	627
+486	Board of Insanity	Boston	Mass.	46,950ab	665
+489	Municipal Electric Light Plant	Staples	Minn.		748
+497	School Board	Richmond	Va.	250a	665
+497	School Board	Richmond	Va.	2000b	665
+498	City Light & Water Plant	Grafton	N. D.	550	665
+502	Water & Light Dept.	Perry	Okla.	1,100b	665
+503	Board of Education	Evanston	Ill.	1,400ab	665
+507	Board of Education	Allentown	Penn.	1,600 to 1,800a	665
+509	City Government	Chelsea	Mass.	1,700ab	665
+513	City Government	Pawnee	Okla.	1,500b	665
+515	Board of Education	Elmira	N. Y.	687a	665
+515	Board of Education	Elmira	N. Y.	1,167b	665
+548	Purchasing Officer	Washington	D. C.	48,125b	708
+548	Purchasing Officer	Washington	D. C.	9,355a	708
+550	U. S. Engineer Office	Norfolk	Va.	3,000b	709
+564	U. S. Engineer Office	New Orleans	La.		748
+573	Board of Education	Kokomo	Ind.	800b	749
+585	U. S. Government	Washington	D. C.	73,500b	749
+585	U. S. Government	Washington	D. C.	29,510a	749

a Indicates anthracite coal. b Indicates bituminous. c Coke.

Supplemental Notes

Under this heading additional or supplemental information regarding old contracts appears, together with the page number of the original notice.

✚**No. 228—Cambridge, Mass.**—Sealed proposals were received on this contract (p. 446) until 8 p.m., Apr. 30. There will be from 5000 to 7000 tons of bituminous coal and 4000 to 6000 tons of anthracite required in addition to some wood. All bids must be accompanied by a certified check for $500, and the successful bidder will be required to furnish a satisfactory bond for 20% of the estimated amount of the contract awarded. Proposal forms and specifications may be had on application. Address Supt. of Schools, Michael E. Fitzgerald, City Hall, Cambridge, Mass.

✚**No. 397—Lorain, Ohio**—Bids on this contract (p. 567) will be received until May 12 instead of Apr. 19 as previously announced. All bids must be accompanied by certified checks for $100, and specifications can be seen at the rooms of the School Board. Bids must be submitted on blank forms furnished by the board for that purpose. Address Clk. E. Bruell, Board of Education, Lorain, Ohio.

✚**No. 402—New Haven, Conn.**—Bids on this contract (p. 567), which provides for furnishing the fuel requirements for the local Board of Education, will be received until 5 p.m., May 4. Copies of specifications and proposal forms may be obtained on application. Address Secy. of Bd. of Edu. G. T. Hewelett, 87 Orange St., New Haven, Conn.

✚**No. 461—Boston, Mass.**—Bids on this contract (pp. 627, 748), which provides for furnishing various harbor institutions with coal, were as follows:

		H. T. Sch. C. Co.		Metro. C. Co.		N.E.C. & C.Co.	Gor. Loe. C. Co.	
	Tons	1	2	1	2	1	1	2
Children's Inst. Dept.	800	...	$4.16	$4.10	...	$4.11	...	
Infirmary Dept.	6,000	...	3.72	...	$3.68	4.06	$3.87*	$3.84*
Pub. Wks. Dept. (Ferries)	11,000	$3.88	3.66	...	3.69	3.89	....	...
Pub. Wks. Dept. (Pasture)	8,000	3.96	3.68	...	3.70	3.98	...	...
Penal Inst. Dept.	6,500	...	3.36	...	3.38	3.67	...	...
Hospital Dept.	9,000	...	3.46	3.80	...	3.91	...	...

*Proposal not in due form.

Address Supt. of Supplies D. Frank Doherty, Room 808, City Hall Annex, Boston, Mass.

✚**No. 465—St. Louis, Mo.**—Bids on this contract (p. 627), which provides for furnishing the local Board of Education with about 37,000 tons of bituminous and anthracite coal, will be received until 2 p.m., May 4. Address Supply Comr. E. M. Brown, 3431 School St., St. Louis, Mo.

✚**No. 487—Reading, Ohio**—Bids on this contract (p. 665), which provides for furnishing 2000 tons of New River smokeless coal, either nut, slack or mine-run, at the local Electric Light & Water Works Department, will be received until noon, May 10, instead of about May 1, as previously announced. Deliveries are to be made as required during the fiscal year beginning June 1. A certified check for $100 must accompany each bid. Address Clk. C. V. Dils, Bd. of Pub. Affairs, 1701 Main St., Reading, Ohio.

✚**No. 507—Allentown, Penn.**—Bids on this contract (p. 665) were closed on Apr. 28. The contract provides for 1500 tons of pea, 100 tons of chestnut, and 75 tons of stove coal. Deliveries are to be completed by Aug. 2. Address Secy. T. P. Wenner, Board of Education, Allentown, Penn.

✚**No. 558—Hamilton, Ohio**—The bids on this contract (p. 709) will be received until noon, May 12. Guaranteed analysis must accompany all bids, and the requirements are as follows: 1600 tons of high-grade mine-run smokeless, 1600 tons of high-grade mine-run bituminous, 400 tons of high-grade nut and slack coal. Bids must include cost of delivery in the basements of various school houses as directed, during the school year 1915-16. Address Clk. Charles F. Holdefer, Bd. of Edu., Hamilton City School District, Hamilton, Ohio.

✚**No. 572—New York, N. Y.**—The requirements on this contract (p. 749), which provides for furnishing various army posts with coal, have been reduced the following amounts: Bituminous, 34 tons; anthracite, 20 tons. Address Col. A. L. Smith, Depot Quartermaster, Army Bldg., Whitehall St., New York City.

New Business

✚**No. 596—Galveston, Tex.**—Sealed bids will be received until 2 p.m., May 5, for furnishing and delivering coal to vessels of the United States Coast Guard during the fiscal year ending June 30, 1916. Address Collector F. C. Pabst, Custom House, Galveston, Tex.

No. 597—Columbus, Ohio—The Board of Education will open bids May 4 for approximately 9000 tons of coal, to be delivered to the various school buildings of the city. The specifications call for lump coal either from the Hocking Valley, Pocahontas or New River district or from other fields in West Virginia. Prospective bidders are asked to submit bids on any or all varieties. Address Clk. Bd. of E. B. McFadden, Columbus, Ohio.

No. 598—New Orleans, La.—The United Fruit Co. will receive bids beginning May 1 on a three-year contract to supply all its ships with coal. The requirements amount to 150,000 short tons annually, and this is the largest contract to be let in this vicinity. The business has heretofore been held by the Monongahela Coal & Coke Co. Address Purchasing Agent, United Fruit Co., New Orleans, La.

No. 599—Louisville, Ky.—The J. M. Robinson, Norton & Co., who use over 120 tons of coal a month, will contract June 1 for a year's supply, half of which must be No. 8 Kentucky steam nut coal and half Pittsburg and Jellico nut and slack. Delivery by wagon. Address J. B. Curry, J. M. Robinson, Norton & Co., 533 West Main St., Louisville, Ky.

No. 600—Chicago, Ill.—The American Electric Co. will be in the market about June 1 for three cars per month of Illinois mine-run coal. The contract is to cover a period of one year. Address Mr. Boice, American Electric Co., 64th and State St., Chicago, Ill.

No. 601—Clinton, Iowa—The Clinton Sugar Refining Co. will be in the market on or about June 1 for their yearly requirements, approximating 70,000 tons of coal, in average monthly shipments of 6000 tons. They have been using some Illinois 1½-in. to 2-in. screenings. Address Traffic Manager, Clinton Sugar Refining Co., Clinton, Iowa.

+No. 602—Beverly, Mass.—The City Government of this place received bids until 7 p.m., Apr. 30, to supply its coal requirements for the season of 1915. All bids must be accompanied by a certified check for $200 and must be made in accordance with specifications on file at the office of the clerk at the City Hall. Address Clk. of Coms. Frederick B. Browning, Beverly, Mass.

No. 603—Louisville, Ky.—The Inter-Southern Life Insurance Co., which usually consumes about six tons a day, will be in the Market June 1 for a year's supply of mine-run coal. Delivery is by wagon and in quantities as required. Address Supt. G. W. Weingardner, Inter-Southern Life Insurance Company, Inter-Southern Bldg. Louisville, Ky.

+No. 604—Newton, Iowa—Sealed bids will be received until 7:30 p.m., May 5, for furnishing the local Water Works Plant with coal during the fiscal year beginning June 1. Bids are requested on lump, mine-run and steam coal, and are to include cost of delivery in bins at the pumping station. Address City Clk. E. G. Finch, Newton, Iowa.

+No. 605—New York, N. Y.—Sealed bids will be received until 2 p.m., May 5, for furnishing, delivering and trimming 650,000 lb. of egg coal to the Asphalt Plant, 90th and 91st St. and East River. Deliveries are to be completed by Dec. 31. A bond for $700 will be required, and all bidders must inclose a check for 5% of their bids. Blank forms and specifications may be obtained on application. Address Pres. of the Borough Marcus M. Marks, Room 2034, Municipal Bldg., New York.

No. 606—Fort Wayne, Ind.—The Bash Fertilizer & Chemical Co. will probably enter into a contract about June 1 for steam coals. They prefer Ohio and West Virginia coals. Address Receiver E. W. Cook, Bash Fertilizer & Chemical Co., Fort Wayne, Indiana.

+No. 607—New Orleans, La.—Bids will be received until 2 p.m., May 5, for furnishing and delivering coal to vessels of the U. S. Coast Guard at this place. Address Special Deputy Collector Calhoun Fluker, Custom House, New Orleans, La.

No. 608—Louisville, Ky.—The Louisville Cereal Mills will let a contract June 1 for their annual supply of nut and slack coal, involving between two and three cars a week. Bids are let on a competitive basis. Address L. C. Ewing, Louisville Cereal Mills, Louisville, Ky.

+No. 609—Munhall, Penn.—The Board of Education at this place will receive bids until May 8 for furnishing lump and slack coal to the local school. Address Secy. Bd. of Dir. John Bell, Jr., 1302 Louise St., Munhall, Penn.

No. 610—Dubuque, Iowa—The A. Y. McDonald Manufacturing Co. will soon be in the market for their coal and coke requirements for another year beginning June 1, 1915. Address Purchasing Agent, A. Y. McDonald Manufacturing Co., Dubuque, Iowa.

+No. 611—Ada, Minn.—The Water and Light Commission at this place will receive bids until 8 p.m., May 3, for furnishing coal required at the Electric Light Plant during the fiscal year terminating Apr. 1, 1916. Address Clk. Peter Sharpe, Water and Light Commission, Ada, Minn.

+No. 612—New York—Sealed proposals will be received until 11 a.m., May 6, for furnishing and delivering approximately 84,160 gross tons of anthracite and 4700 tons of semi-bituminous coal to the New York schools and the several offices of the Department of Education. Separate bids must be submitted for each district, and deliveries are to be completed before Mar. 31, 1916; deliveries are to be at such times and in such quantities as may be directed. Blank forms and further information may be obtained on application. Address Supt. of School Supplies Patrick Jones, Bd. of Edu., Park Ave. and 59th St., New York City.

+No. 613—Emmetsburg, Iowa—The City Government at this place will receive bids until 8 p.m., May 3, for furnishing coal as may be required. Address City Clk. T. F. Rutledge, Emmetsburg, Iowa.

+No. 614—Titusville, Penn.—The Board of Education at this place contracts about June 1 of each year for 2000 tons of coal. The current contract provides for three quarter Youghiogheny lump at $2.40 per ton f.o.b. The call for bids is advertised. Address City Mgr., H. A. Holstein, Titusville, Penn.

+No. 615—Seattle, Wash.—Sealed proposals will be received by the Coast and Geodetic Survey for furnishing the fuel requirements of five steamers at different points in Alaska during the coming summer. Address Capt. J. F. Pratt, Inspector, Coast and Geodetic Survey, 204 Burke Bldg., Seattle, Wash.

+No. 616—San Francisco, Calif.—Sealed proposals will be received by the lighthouse inspector at this place until May 21 for furnishing the annual supply of bituminous coal. Blank proposal forms and particulars may be obtained on application. Address, Lighthouse Inspector, San Francisco, Calif.

+No. 617—Kalamazoo, Mich.—The Municipal Government at this place will be in the market about June 1 for 2000 tons of West Virginia slack coal. The call for bids is advertised and the current contract was made at about $2.72½ per ton. Address, City Clk., C. L. Miller, Kalamazoo, Mich.

+No. 618—Toledo, Ohio—Bids will be received by the local Board of Education until May 1 for furnishing approximately 10,000 tons of coal to the public schools during the fiscal year beginning June 1. Address, Dir. of Schools Geo. L. McKesson, Administration Bldg., Toledo, Ohio.

+No. 619—Appleton, Minn.—Sealed proposals will be received by the Village Council until 8 p.m., May 3, for furnishing approximately 600 tons of Youghiogheny lump coal. Prices should be quoted f.o.b. cars at Appleton. Address, Recorder Henry Lende, Appleton, Minn.

+No. 620—Webster, S. D.—The Municipal Government at this place will receive sealed bids until 8 p.m., May 3, for furnishing steam coal as required until Apr. 1, 1916. Prices should be quoted f.o.b. shipping point. Address, City Audr. J. B. Egeland, Webster, S. D.

+No. 621—Luverne, Minn.—The Municipal Government at this place will contract about June 1 for 1200 to 1500 tons of coal for delivery during the next year. The present contract is being filled with Illinois "Purity" 3x6 egg, for which $1.40 is being paid f.o.b. mines. Address Supt. Jas. Hughes, Municipal Power Plant, Luverne, Minn.

+No. 622—Lancaster, Penn.—Sealed proposals will be received by the Municipal Government until 9 a.m., May 3, for furnishing coal to the Lancaster County Prison, as follows: 125 tons of pea; 100 tons of nut; 25 tons of broken. Address, Solicitor W. H. Kready, 42 North Duke St., Lancaster, Penn.

+No. 623—Newton, Iowa—The Municipal Government at this place will be in the market about June 1 for 20 tons of Iowa mine-run coal per day. The call for bids is advertised, and the current contract was made at $2.48 per ton. Address, Supt. C. O'Leary, City Power Plant, Newton, Iowa.

+No. 624—Providence, R. I.—The Board of Education at this place will be in the market about June 1 for 8500 tons of anthracite coal to be delivered as required. The contract last year was awarded on Lehigh (Highland) egg coal at $5.94 per ton. Bids are requested by circular letter. Address School Committee, 32 Sumner St., Providence, R. I.

+No. 625—Mt. Clemens, Mich.—Sealed bids were received by the Board of Public Works until 4 p.m., Apr. 30, for furnishing the coal requirements for the local water works pumping station during the fiscal year beginning June 1. The bids were received on Hocking Valley and West Virginia threequarter lump, and for nut, pea, and slack coal. Address Deputy City Clk., Marie J. Behnke, Bd. of Pub. Wks., Mt. Clemens, Mich.

+No. 626—Boston, Mass.—Sealed proposals will be received until 2 p.m., May 5, for furnishing and delivering on board vessels, coal required by the United States Coast Guard at this place. Proposals must in all cases conform with specifications, instructions, etc., copies of which may be had on application. Address Collector Edmund Billings, Custom House, Boston, Mass.

+No. 627—Lancaster, Penn.—The School Board at this place received bids until 11 a.m., Apr. 27, for furnishing about 1000 tons of anthracite, pea, nut, stove, and egg coal. Address Chn., A. C. Welchans, 202 James St., Lancaster, Penn.

No. 628—Elkhart, Ind.—The Chicago Telephone Supply Co. is in the market for their fuel requirements for the year 1915, covering two or three carloads of West Virginia or Kentucky coal per month. They are asking quotations on Kentucky block and egg. Address Pur. Agt. A. J. Briggs, Chicago Telephone Supply Co., Elkhart, Ind.

+No. 629—Medford, Mass.—Sealed proposals were received until 9 a.m., Apr. 30, for furnishing the local Fire Department with 137 tons of the best grade anthracite egg, stove, and pea coal. Price to be quoted for delivery at the different fire houses at such times and quantities as may be required. Address Chief of Dept., C. E. Bacon, City Fire Department, Medford, Mass.

+No. 630—Norwood, Mass.—Sealed proposals were received until 8 p.m., Apr. 30, for furnishing the local Municipal Government with coal as follows: Stove, 45 tons; broken, 260 tons; egg, 50 tons; nut, 25 tons; Pocahontas bituminous, 870 tons. Bids were to be f.o.b. Norwood or delivered at the various municipal buildings. Address Gen. Mgr. C. A. Bingham, Bd. of Selectmen, Municipal Building, Norwood, Mass.

+No. 631—Milwaukee, Wis.—Sealed proposals will be received by the Department of Public Works until 10:30 a.m., May 1, for furnishing and delivering 1000 tons of coal to the High Service pumping station, delivery to commence within ten days after the award of the contract and continue at

the rate of 80 tons per month. The successful bidder must furnish either a deposit of $500 or a bond for $1000. Address Deputy Comr. of Pub. Wks., Percy Braman, Department of Public Works, Milwaukee, Wis.

✚**No. 632—Phillipsburg, N. J.**—The Board of Education at this place received bids until 8 p.m., Apr. 28, for furnishing the coal required at the public schools during the ensuing year. Specifications are on file at the office of the Secretary of the Board. Address Secy. George W. Smith, Bd. of Ed., Phillipsburg, N. J.

✚**No. 633—Hot Springs, S. D.**—Sealed proposals will be received by the National Home for Disabled Volunteer Soldiers until 2 p.m., May 12, for furnishing 9000 net tons of lignite coal during the ensuing year. Blank proposal forms and specifications may be had on application. Address Treas. and Quartermaster, William H. Stanley, N. H. D. V. S., Hot Springs, S D.

✚**No. 634—Pipestone, Minn.**—The City Government at this place is advertising for coal for the local pumping station. Youghiogheny lump and Elkhorn screenings are required. Address City Clerk, Pipestone, Minn.

✚**No. 635—Ortonville, Minn.**—Sealed bids will be received by the City Government at this place until 8 p.m., May 3, for furnishing approximately 700 tons of Pocahontas coal to be delivered at the City Water and Light Plant. Address City Clk. M. E. Scheibe, Ortonville, Minn.

✚**No. 636—Melrose, Minn.**—The Water and Light Commission at this place will receive bids until 8 p.m., May 3, for furnishing about 1200 tons of rough lump coal. Address Charles Kramer, Bd. of Water and Light Commission, Melrose, Minn.

✚**No. 637—Toledo, Ohio**—The Board of Education at this place will receive bids until noon, May 1, for supplying coal during the year ending June 1, 1916, as follows: 3300 tons of West Virginia smokeless mine-run, 3400 tons of West Virginia gas mine-run, 3000 tons of West Virginia or Kentucky slack, 275 tons of smokeless egg or lump, 200 tons of egg, stove and chestnut. A certified check for $1000 must accompany all bids for bituminous coal and a check for $100 must accompany the bids on anthracite. Bidders must also give full particulars regarding the commercial name of the coal and price quoted is to be per short ton and cover cost of delivery in bins and trimmed. About 7000 tons is to be delivered before Sept. 1 of the current year. The coal is in all cases to be subject to inspection before unloaded from the railroad car. Address Dir. of Schools George L. McKesson, Toledo, Ohio.

✚**No. 638—Baltimore, Md.**—Sealed proposals will be received until May 5 for supplying the United States Coast Guard, together with vessels at Arundel Cove, Md., with coal as may be required during the fiscal year ending June 30. Proposals must, in every case, conform with the specifications, instructions, etc., which may be obtained on application. Address Collector W. S. Ryan, Custom House, Baltimore, Md.

No. 639—Boston, Mass.—Sealed proposals will be received until 4:30 p.m., May 1, for furnishing 200 tons of coal to the Franklin Union Building. A certified check for $50 must accompany each bid, and details in regard to commercial name of the mine, location, etc., given. Address Pres. Richard Olney, the Franklin Foundation, Berkeley St., Boston, Mass.

Awards

✚**No. 282—Meriden, Conn.**—This contract (p. 448), which provides for furnishing the local schools with 800 tons of anthracite coal, has been awarded to **Lyon & Billard.** Address Town School Committee, Meriden, Conn.

✚**No. 443—Troy, N. Y.**—This contract (p. 627) has been awarded to **Peterson & Packer Coal Co.** on the following basis:

	City Hall	Schools
Grate coal	$5.48	$5.68
Egg	6.25	6.54
Stove	6.25	6.54
Chestnut	6.38	6.73
Pea	4.87	4.75

The prices given are for April delivery. On grate coal an addition of 10c. per ton is made for May delivery, 20c. on deliveries between June 1 and 15, and 25c. on deliveries made between June 15 and Mar. 31, 1916. The prices on all other grades are uniform throughout the period. For the Department of Charities deliveries of stove coal in half-ton lots will be made at $6.60, and $6.75 in quarter-ton lots; deliveries of chestnut at $6.85 in half-ton lots, and $7 in quarter-ton lots. Address Secy. John J. McLaughlin, Board of Contract and Supply, Room 21, City Hall, Troy, N. Y.

✚**No. 446—Buffalo, N. Y.**—The Larkin Co. advises that it has closed its contract (p. 627) providing for a supply of slack coal. Address Pur. Agt. F. J. Arthurs, Larkin Co., Buffalo, N. Y.

✚**No. 452—San Francisco**—This contract (p. 627), which provides for furnishing coal for army transports and other purposes at this place was awarded to the **Western Fuel Co.** on Wellington coal. Prices varied according to delivery as follows: In holds of vessels, transport dock, $6.86; on board vessels in sacks, $8.11; at recruiting office, Oakland, Calif., $11; at S. F. National Cemetery, $10.50. Address Depot Quartermaster, Lieut.-Col. W. H. Hart, 1086 North Point St., San Francisco, Calif.

✚**No. 491—Alexandria, Minn.**—This contract (p. 665), which provides for furnishing the Local Board of Public Works with from 1500 to 1800 tons of Elkhorn and Youghiogheny screenings, has been awarded to the **Northwestern Fuel Co.,** of St. Paul, Minn. Address Chf. Clk., C. J. Smidblad, Board of Public Works, Alexandria, Minn.

✚**No. 566—Boston, Mass.**—Awards on this contract (p. 709), which provides for furnishing the Board of Education with fuel requirements for the period beginning June 15 of the current year and ending Jan. 31, 1916, were as follows: BITUMINOUS—**Massachusetts Wharf Co.,** East Boston, $4.30; Brighton, $4.40. **D. Doherty Co.,** Dorchester, $4.33. **John A. Whittemore's Sons,** West Roxbury, $4.55. **Metropolitan Coal Co.,** the whole city, $4.38. **City Fuel Co.,** the whole city, $4.10. ANTHRACITE—**The Staples Coal Co.** was awarded most of the anthracite portion of this contract at $5.84 for furnace and $6.37 for egg, its contracts covering the following districts either in their entirety or in part: City proper, South Boston, East Boston (in part), Roxbury, Dorchester (in part), Charlestown, Brighton (in part), West Roxbury, Hyde Park, the whole city (in part). **The Massachusetts Wharf Coal Co.** was awarded part of the East Boston contract at $5.80 for furnace and $6.32 for egg; also part of the Brighton contract at $5.96 for furnace and $6.84 for egg. **D. Doherty Co.** was awarded part of the Dorchester contract at $5.82 for furnace and $6.37 for egg. **The Brighton Coal Co.** was awarded part of the Brighton contract at $5.83 for furnace and $6.38 for egg. **The Metropolitan Coal Co.** was awarded part of the contract for the whole city at $5.94 for furnace and $6.24 for egg. **The City Fuel Co.** was also awarded a portion of this same contract at $5.70 for furnace and $6.15 for egg. Address Bus. Agt. William T. Keough, Room 801, City Hall Annex, Boston, Mass.

✚**No. 568—Albany, N. Y.**—This contract (pp. 709, 748) has been awarded to the **Montgomery Coal Co.,** of Albany, at prices previously noted. A bond of $10,000 is required on this contract. Address Supt. William H. Storrs, Capitol Bldg., Albany, N. Y.

✚**No. 595—Hartford**—This contract (p. 750), which provides for furnishing the State Capitol with anthracite coal, has been awarded to **W. C. Mason & Co., Inc.,** Address Comptroller Morris C. Webster, State Capitol, Hartford, Conn.

Contract Notes

Lawrence, Mass.—Theberge Bros., Lawrence, Mass., has been awarded a contract for supplying the Water Department at this place with 1300 tons of New River coal at $4.93 per ton.

Rochester, N. Y.—Press reports state that bids were recently opened for furnishing the county institutions with a large quantity of coal. Address the Monroe County Building Commission.

Clinton, Mass.—The contract for furnishing the local school department with about 400 tons of egg coal and 70 tons of broken coal has been awarded to **Connery Bros.** at $7.65 for egg and $7.45 for broken coal. Other bidders on this contract were as follows: Charles Frazer & Sons, egg, $7.71, broken, $7.47; Consolidated Ice & Coal Co., egg, $7.81, broken, $7.56; Philbin Bros., egg, $7.76, broken, $7.56. Address Board of Education, Clinton, Mass.

Fall River, Mass.—The American Printing Co. closed its contract for about 75,000 tons to the Chesapeake & Ohio Coal Agency Co., on New River coal.

Boston, Mass.—The Central New England Ry., subsidiary to the N. Y., N. H. & H. R.R., closed its annual contract, 150,000 tons locomotive coal, to the New England Coal & Coke Co., on Federal Coal & Coke Co.'s (W. Va.) gas coal.

St. Louis—An unusual development at this season of the year is the call from Mississippi River points south, for all-rail Illinois coal. This is accounted for by low water in the Ohio River and tributaries, which is the lowest in fifty years. No coal has come down the Ohio for the south since Feb. 20, and millions of bushels are held in barges, awaiting high water.